MARCH
1933

First Copy

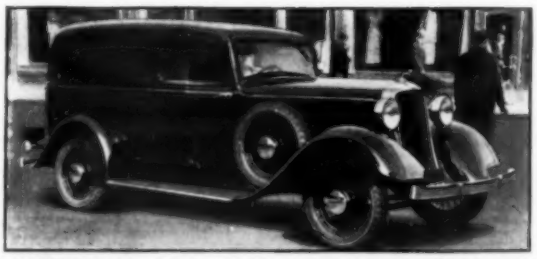
FLEET OWNER

THE FERGUSON PUBLISHING CO., 90 WEST ST. NEW YORK, N.Y.

Devoted to the Better Operation and Maintenance of Truck, Bus, Taxicab, Passenger Car and All Automotive Fleets

NEW COMMERCIAL CARS ARE ADDED TO FAMOUS DODGE TRUCK LINE

"These New Commercial Cars Offer The Most Amazing Values We Have Ever Seen" . . . say business men everywhere.



COMMERCIAL SEDAN—Stylish, dependable, surprisingly low priced. Floating Power engine mountings and other great features. **$555**

COMMERCIAL PANEL—New beauty but every inch a Dodge for dependability. See these new Dodge models. **$540**

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Here's big news for every fleet owner. Dodge has now added a remarkable new line of Commercial Cars to the Dodge truck line. These new cars are unquestionably the handsomest ever seen on any highway. Low first cost and remarkable economy of operation make them ideal for fleet use. See your local Dodge dealer or write without obligation for descriptive literature.

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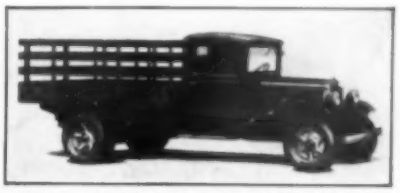
Department 325
DETROIT, MICHIGAN

ALL PRICES F.O.B. FACTORY, DETROIT

DODGE TRUCKS



DODGE 2-TON STAKE TRUCK—Handles maximum tonnage on fastest schedule Many superior features.

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Dodge offers a line of Trucks and Commercial Cars for practically every hauling need. Capacities from ½-Ton to 9-Tons (larger in tractor-trailer service).

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F.O.B. Factory, Detroit

40,000 TRUCK MILES FREE!

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THE Continental Baking Company, operators of one of the country's largest and finest fleets of trucks, are proud of their operating and maintenance records.

In Continental's Jamaica Division the Cities Service Power Prover was first introduced immediately after the fleet of 57 White, Ford and Dodge trucks had been put through the regular overhaul routine. The Power Prover indicated quickly that even further adjustments were necessary before maximum economy and performance could be attained. These adjustments were made. The result was that this Continental fleet ran 40,000 *more truck miles on the same amount of gasolene.* The Power Prover at once became an established part of their overhaul routine.

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Owing to our original formula, GASKET GOO does not cement the joint together in such a way as to make trouble when you want to open it up. So you need no softer grade. It sets firmly enough to keep all leaks from starting. So you need no grade that sets like flint.

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The

FLEET OWNER

Published Monthly in the interests of Automotive Fleet Owners who maintain their own Repair and Service Shops and devoted to the better Operation and Maintenance of Truck, Trailer, Bus, Passenger Car, Taxicab and all Automotive Fleets.

Vol. 10 New York, March, 1933 No. 3

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Published Monthly by

The FERGUSON PUBLISHING COMPANY

90 West Street, New York City

E. F. Ferguson
President

A. L. Conley
Sec. and Treas.

Henry Clay Fischer
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ADVERTISING REPRESENTATIVES:

Chicago—D. B. Trott, 840 Montrose Ave., Tel. LONg Beach 2331.
Detroit—E. C. Hillier, 190 E. Grand Blvd., Tel. Fitzroy 9382.
Los Angeles—R. H. Deibler, 244 W. 15th St., Tel. Richmond 5274.
New York—J. Hayes Fuller, 90 West Street, Tel. REctor 2-9179.
Philadelphia—Hal. H. Clark, 170 Woodbine Rd., Manoa, Pa.

Subscription: $1.00 Yearly; Single Copies 10c.

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These two new members of the GMC line constitute the ideal combination of power, performance, and economy in their respective capacity ranges. And they complete the most comprehensive, balanced line of commercial vehicles ever developed.

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General Motors Truck Company, Pontiac, Michigan

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BUSINESS_____

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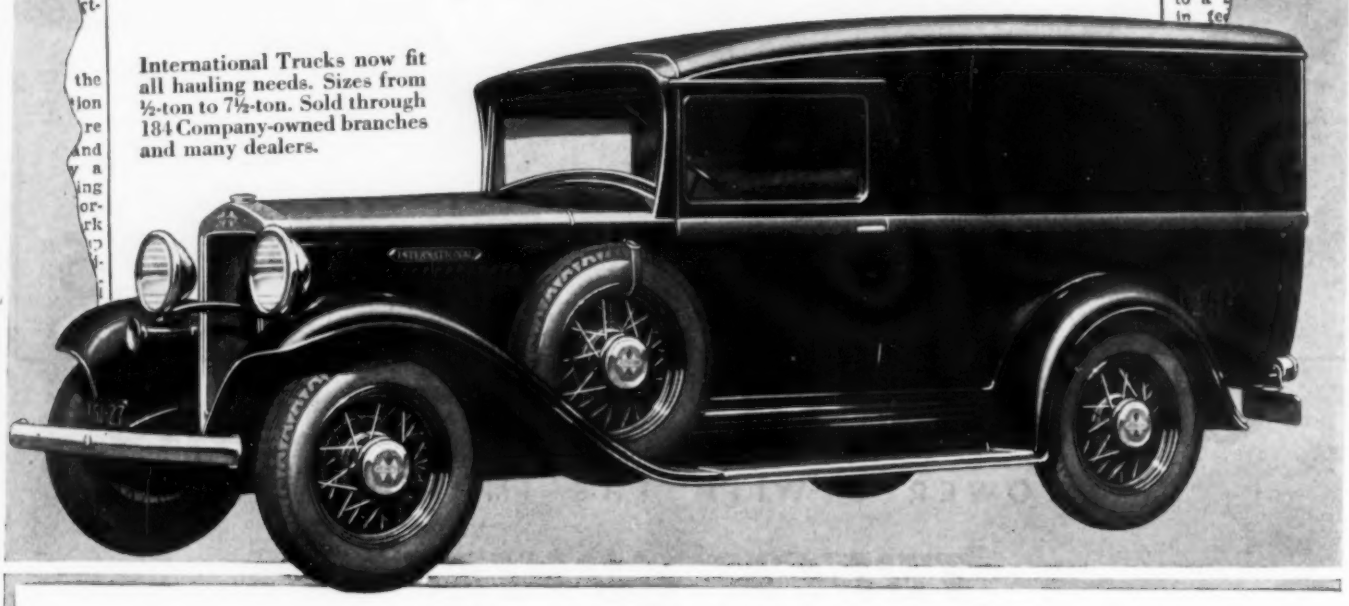
International Trucks now fit all hauling needs. Sizes from ½-ton to 7½-ton. Sold through 184 Company-owned branches and many dealers.



$360

chassis f.o.b. factory (tax extra)

Rated Capacity: 1/2-ton.
Wheelbase: 113 inches.
Engine: 6-cylinder, L-head type, 3-5/16-inch bore x 4-1/8-inch stroke. Develops 70 horsepower. Exhaust valve seat inserts. Full pressure lubrication. Downdraft carburetion. Air cleaner.
Clutch: 9-inch single plate, with built-in vibration damper.
Rear Axle: Spiral-bevel gear type. Hotchkiss type final drive. Chrome-molybdenum axle shafts, pressed steel housing. Tapered-roller differential and axle-shaft bearings.
Brakes: 4-wheel mechanical, 2-shoe type, self-energizing, internal-expanding and cable-controlled.
Springs: Semi-elliptic. All leaves of chrome-vanadium steel. Self-adjusting spring shackles.
Wire wheels: 40-spoke, 18-inch with 5.25-18 balloon tires.
Standard equipment includes trumpet horn, spare wire wheel, fender well tire carrier, front and rear fenders, and full-length running boards. All instruments attractively grouped in panel on dash.

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For it is on *quality* that International Harvester built its outstanding success. Because of *quality* it has steadily increased its leadership among full-line truck manufacturers, greatly improving its relative position during the recent difficult years.

It has established this record on chassis prices never lower than six hundred dollars and ranging up to more than six thousand. High reputation, dependable performance, and unfailing service have brought new International buyers in increasing thousands.

Now new conditions have given us our opportunity. *Today* International provides another product of high quality in the new International Half-Ton Model D-1.

This new 6-cylinder truck at its remarkably low International price takes with it every guarantee that every International Truck carries. It is safeguarded by the nation-wide service that makes every International more valuable to its owner throughout the years of its life.

You are cordially invited to visit any International Branch or dealer and see this new half-ton International.

INTERNATIONAL HARVESTER COMPANY OF AMERICA *(Incorporated)**
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INTERNATIONAL TRUCKS

Say "I saw it in FLEET OWNER"—It Helps!

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CUT MAINTENANCE COSTS

It is a CELORON gear with a cast aluminum center. It provides metal to metal contact where the gear bolts on to the camshaft — insuring many additional thousands of miles of silent service.

Available in three Oversizes

This new CELORON cam gear — item No. 77 — is made in .002, .004 and .006 oversizes as well as standard. This range of oversizes makes it possible to replace any camshaft gear *without* replacing the metal crank gear. When the cam gear only is replaced it is not necessary to remove the radiator—effecting a substantial saving for you.

CELORON TIMING GEARS ARE IMMEDIATELY AVAILABLE THRU THE N.A.P.A. — IF YOU DON'T KNOW THE N.A.P.A. JOBBER NEAR YOU, WE'LL BE GLAD TO FURNISH THIS INFORMATION.

CONTINENTAL - DIAMOND FIBRE CO.

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WHAT AN ENGINE!

75 TRUCK HORSEPOWER

"MAN what an engine—and what a truck—it's a real profit maker. This big 75 h. p. engine has all the power I ever need on the toughest kind of hauling. It has *proved* its ability and it has everything I want—power, smoothness—lots of miles to the gallon and it's never in the shop. There is no limit to its endurance and its cost per mile is the lowest of any truck I ever operated." These are the things Studebaker operators tell us.

This Studebaker built truck engine has *proved* itself to thousands of owners. It has remarkable torque and high power development over a wide range of speed—it has fine balance, it has electro-plated pistons fitted to .0015 inch as compared to the conventional .003 to .004 inch. The plating of bearing metal gives added thousands of miles of wear, seals in the power and prevents "blow by", plug fouling and crank case dilution. In every detail it is the finest, medium duty truck engine built.

Studebaker trucks are balanced units—built according to Studebaker's 80 years of quality tradition. That is why Studebakers are Profit Makers.

THE WHITE COMPANY—Cleveland, O.—South Bend, Ind.

Power developed at low speeds by Studebaker Truck Motor

40 H. P. at 1370 R. P. M.
45 H. P. at 1540 R. P. M.
50 H. P. at 1760 R. P. M.
55 H. P. at 1980 R. P. M.
60 H. P. at 2180 R. P. M.
65 H. P. at 2410 R. P. M.
70 H. P. at 2700 R. P. M.
75 H. P. at 3200 R. P. M.

PRICES

1½ TO 2 TONS
Vehicle Gross Weight
8000 to 9000 pounds

130" W. B.	$670
141" W. B.	695
165" W. B.	745

Power brakes or helper springs extra

1¾ TO 2½ TONS
Vehicle Gross Weight
9000 to 10,500 pounds

130" W. B.	$785
141" W. B.	815
165" W. B.	865

2 TO 3 TONS
Vehicle Gross Weight
10,500 to 12,000 pounds

141" W. B.	$945
153" W. B.	970
165" W. B.	995

3 TO 4 TONS
Vehicle Gross Weight
14,000 to 16,000 pounds

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165" W. B.	1400
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All Prices at Factory. Bumper, spare tire and tax extra. Cabs and standard bodies available on all chassis.

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Your fleet advertises you

Your customers see your fleet all the time. Does its appearance reflect credit on your business? It does, if it is painted frequently. Appearance-maintenance so vitally important, need not be expensive for DeVilbiss Spray-finishing Equipment not only reduces the cost, but it is so fast that trucks are quickly released again for duty.

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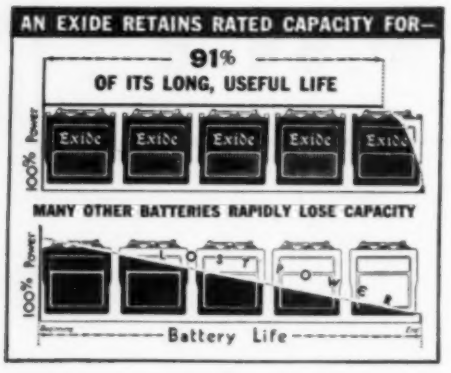
Try the new DeVilbiss Pro-Tek. It is a white cream. Rubbed into the hands, it forms a protective film which lasts for hours. Guards the skin against gasoline, battery acid, fumes, paint, lacquer, oil and grease. Send for free sample.

DeVilbiss

Say "I saw it in FLEET OWNER"—It Helps!

PULL DOWN MAINTENANCE FIGURES *It's easy with Exides because . . .*



LOOK at that chart. It tells why operators who use Exides rejoice in low maintenance costs.

A battery that rapidly loses capacity, regardless of initial cost, is expensive in the long run. High maintenance figures overbalance savings in first cost. The result is money thrown away.

When you invest in Exides, you're sure of your money's worth. That means dependable, economical service, long life, plenty of power for the toughest jobs.

EXIDE ENGINEERING SERVICE

To help you pull down maintenance costs, we have established a Battery Engineering Service. This Service, conducted by carefully trained and experienced battery engineers, is available to fleet operators. There is no charge made.

Exide

BATTERIES

FOR EVERY TYPE TRUCK

THE ELECTRIC STORAGE BATTERY COMPANY, Philadelphia

THE WORLD'S LARGEST MANUFACTURERS OF STORAGE BATTERIES FOR EVERY PURPOSE

Exide Batteries of Canada, Limited, Toronto

Say "I saw it in FLEET OWNER"—It Helps!

THIS JACK CUTS COST

Saves expensive time whenever there's a load to be lifted. ***Speedy.***

Shortcuts awkward jobs of pressing, bending, straightening. ***Handy.***

Works vertically or horizontally, delivering tremendous power, easily and safely controlled, with micrometer accuracy. ***Safe.***

No gears or ratchets. Never out of order. Never drops a load or quits under one. ***Sure.***

No bus, or truck, or shop is completely equipped without one.

On the road it's the most dependable of lifters. In the shop it straightens frames and axles, installs engines and transmissions, presses gears and bushings, or what-have-you.

Just Be Sure It's a Blackhawk

Jack shown above is CB-9, an all-purpose 7-tonner. We make a full line of 24 hydraulic hand jacks—6 Car types, 1-2 tons; 9 Truck-Bus-Shop jacks, 2½-12 tons; 9 Industrial Giants, 18-75 tons. Also Floor Jacks. *Mail the Coupon.*

BLACKHAWK HYDRAULIC JACKS

BLACKHAWK MFG. CO., Dept FO3, Milwaukee, Wis.
Send data on ☐ Hand Jacks, capacity .....tons; ☐ Floor Jacks. Check which.

Name.....

Shop Address.....

Preferred Jobber.....

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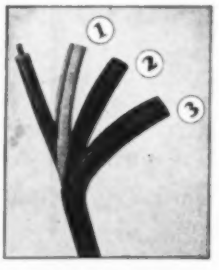
There's the good old saying that "an ounce of prevention is worth a pound of cure." That's particularly important to truck and bus operators who must deliver on time—where one interruption can throw a highly organized transportation system out of gear.

Packard's Super-Duty Ignition Cable—347B, is the result of our years of service to truck and bus operators and manufacturers. It is designed to deliver under the most grueling conditions—to prevent costly ignition failure and eliminate frequent replacement.

Replace weak or faulty cable with Packard 347B. It pays for itself over and over again. Packard Electric Corporation, Warren, Ohio.



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2. Varnished cambric tape
3. Strong braid, multiple "Lac-Kard" processed

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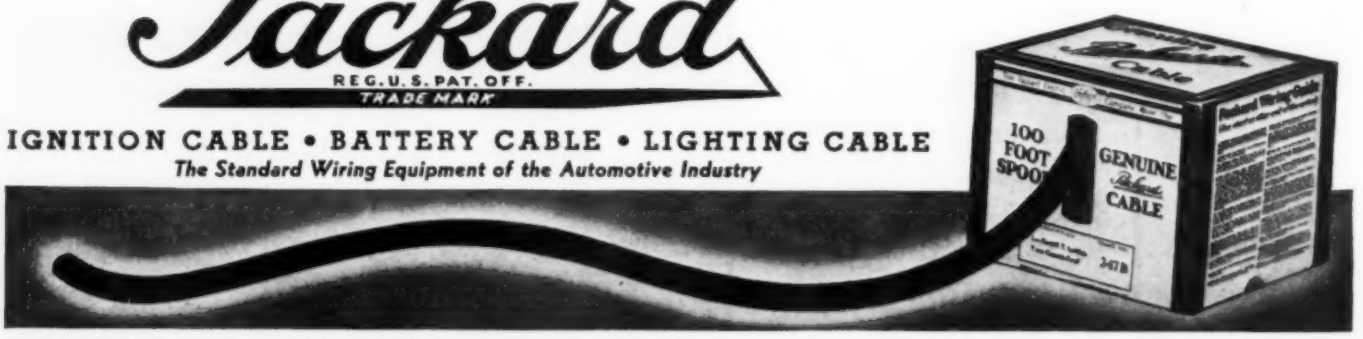
TRADE MARK

IGNITION CABLE • BATTERY CABLE • LIGHTING CABLE

The Standard Wiring Equipment of the Automotive Industry



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that Safety Glass is the best available protection against broken, flying glass.

Bus, cab and fleet operators

know that Safety Glass is the best available protection against CLAIMS FOR INJURY resulting from broken, flying glass.

L·O·F super Safety Glass is used in Dietrich and LeBaron Custom Bodies, Reo Speed Wagons, Twin Coaches, Brill Trolley Buses, Cincinnati Trackless Trolley Coaches, Bender Bus Bodies, Hackney and Springfield School and Passenger Bus Bodies, White School Buses, York-Hoover School Bus Bodies, Crown School and Motor Coach Bodies, Ford School Buses, Stinson and Stearman Aircraft, Gar Wood Boats, Matthews Cruisers and Chris-Craft Cruisers and Runabouts.

Libbey·Owens·Ford super Safety Glass is also used by: Packard • Graham Studebaker • Franklin • Reo • Willys • Ford • Cadillac • LaSalle • Lincoln Buick • Chevrolet • Oldsmobile • Pontiac • Rockne • Auburn • Cord.

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LIBBEY·OWENS·FORD SAFETY GLASS

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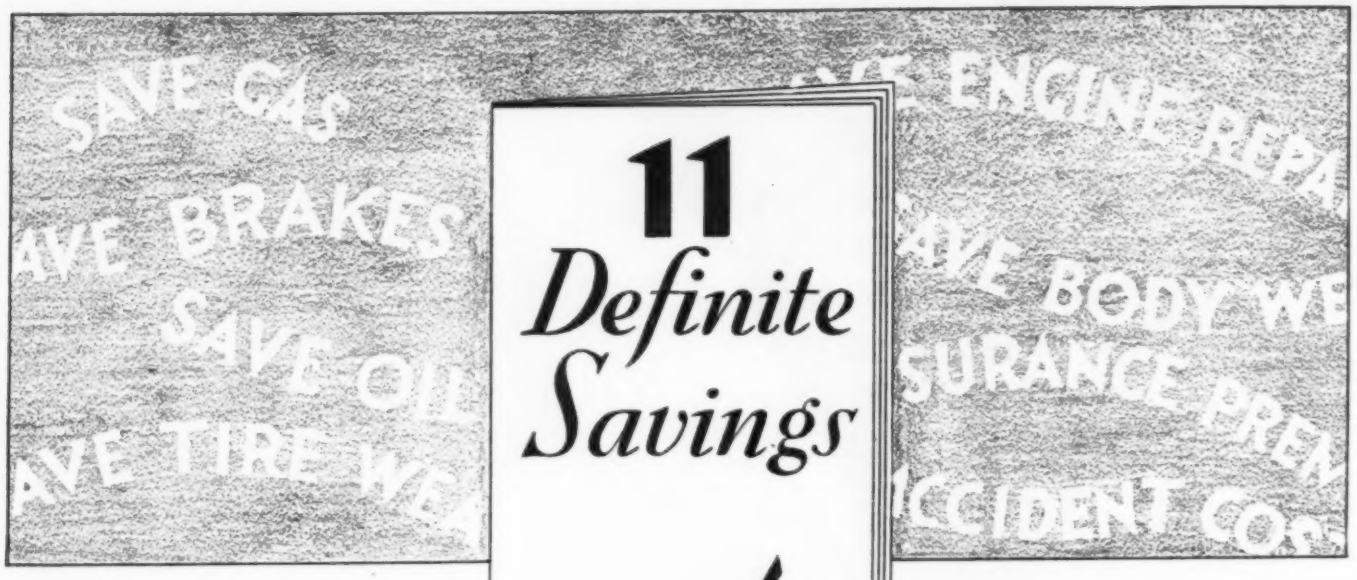
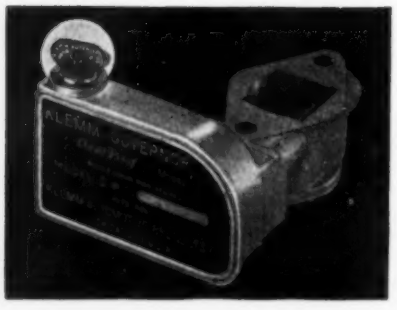


11 *Definite Savings*

Write for this KLEMM GOVERNOR *book of facts*



KLEMM Key Controlled Governor

The only Key Controlled "Cheat-Proof" Governor made. The finest money can buy. Now offered at reduced prices.

KLEMM Seal Type Governor

The same as the Key Controlled Model with conventional seal replacing the key. Low in price, but finest seal type governor made.

READ how other Fleet Operators are cutting Operating Cost as much as 50%. Mail the coupon below the "11 Definite Savings" which contains two important engineering reports (one by Standard Oil, the other by Carter Carburetor), plus the facts and figures of other prominent Fleet Operators' experience with KLEMM Governors. You will wish you had read it years ago! Write for it today. The "11 Definite Savings" will help you operate this year at an increased profit.

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FOR ECONOMY KLEMM "Cheat-Proof" GOVERNOR FOR SAFETY

Say "I saw it in FLEET OWNER"—It Helps!

VOL. 10
NO. 3

The FLEET OWNER

MARCH
1933

DEVOTED TO THE BETTER OPERATION AND MAINTENANCE OF TRUCK, TRAILER, BUS, TAXICAB, PASSENGER CAR, AND ALL AUTOMOTIVE FLEETS.

Unnecessary Evil *or* Economical Adjunct? » »

VAS You Dere, Sharlie? We refer, of course, to the gathering of fleet maintenance men which took place one Thursday evening last month in New York City. Judging by the large attendance, the subject of Fleet Operation and Maintenance is still a mighty strong drawing card, despite the general tendency to stay at home and hear our mutual friend's (the Baron) weekly radio broadcast.

All primed up to hear an interesting discussion on "Controlling Cost Factors in Fleet Maintenance," according to the announcement heralding the meeting, we were somewhat disappointed when neither of the two fleet operator speakers expounded any startling information on cost-controlling factors.

Much to our surprise, the first speaker very strongly urged the absolute discard of the self-maintenance idea in fleets—in favor, of course, of the complete farming-out of all repair work, both major and minor. To the second speaker, due credit must be given for a very interesting treatise on fleet personnel—how to hire and handle them.

The customary discussion following the speakers' remarks, revealed of course, that so far as fleet operators are concerned, no clever prestidigitator can step in, wave his magic wand and cause fleet operators to immediately close their shops, rent out their garage space, sell their tools and shop equipment, dispose of their parts stocks and discharge their personnel. It just is not in order. At least that's what statements from most fleet maintenance men have led us to observe, the excellent service rendered by truck dealers, commercial service stations, etc., notwithstanding.

In theorizing as to why all work should be farmed out, the aforementioned speaker brought up such objectionable (?) factors as the high cost of stocking and handling replacements, the presence of peaks and valleys in the repair schedule, the expense of keeping shop personnel employed during dull periods so that they will be on hand for peak maintenance work, and last but not least, our old friend, "Obsolescence" of parts. It was also pointed out that there is much unnecessary duplication of service facilities, since both the fleet operator and the outside service agencies are equally equipped to perform the work. Interesting, if true.

And "could we write a book" in defense of the self-maintenance idea! In the first place, any well-organized fleet organization usually plans well in advance for the retirement of vehicles from service, so that when this time comes, there is no obsolete stock of parts to throw out in the alley. Next, the proper charting of major overhauls, as practiced by modern-minded operators will practically eliminate most of the peaks and valleys from the shop-schedule curve.

The so-called high cost of stocking and handling parts is in most cases offset by the fact that the parts are really on hand when needed. Holding a vehicle in the shop for several days while some outside agency wires for the replacement would be far more costly, no doubt. Another thing, the excellent distribution facilities of the vehicle, unit and parts manufacturers should result in the reduction, to a minimum, of the fast-wearing parts stocks of fleet operators.

Not that you intend to do it, but try to imagine the marvelous sum of cash you might be able to realize on your second-hand shop equipment, your stock of "parts to fit" the types of vehicles you operate and how much rent you could get (at today's figures) for your shop space, in the event that you decided to follow the recommended plan and throw self-maintenance into the discard. Wouldn't it be lots more satisfactory to struggle along with the shop?

Don't think these are the gentle musings of an idle brain, hatched out from behind a desk. On the contrary, before embarking on this vociferous protest it was our privilege to discuss the subject with several fleet maintenance men who had attended the meeting, but who, for some reason or other, were hesitant to prolong the discussion by taking exception to the theories outlined, although they harbored ideas to the contrary in their own breasts.

Anyway, the meeting was mighty enjoyable and the discussions intensely interesting, even if we were not thoroughly in accord with the exponent of the farming-out principle. Our attendance caused us to miss our favorite radio broadcast, but "Ve Vas Dere, Sharlie" and it was well worth it.

If fleet maintenance men throughout the nation could get together periodically and hold discussions of this character, it would be a splendid thing. Unfortunately, this is physically impossible, except in a few instances, but one of our greatest pleasures (and necessary duties) is to gather the facts (from your experience) and disseminate them through the medium of this publication. We are, of course, always glad to hear from fleet operators on any subject covering operation and maintenance. If you agree with our thoughts as outlined on this page—or if you don't—a letter to the Editor is always welcome. It's now your move!

« »

The
Editor's Page

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« »

H. Clay Fischer
Editor

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Preventive Maintenance *will* Eliminate Road Delays

By Ed. C. Wood,

Supt. of Automotive Equipment, Pacific Gas & Electric Company, San Francisco, California.

IN defining "Preventive Maintenance", the first important requisite to be considered is efficient operation and the most important factor upon which efficient operation depends is the proper adaptation of the vehicle to the job.

The motor truck or bus represents a large investment and it is strange to find that in many cases it is not treated accordingly. It is impossible to obtain economy and efficient operation unless this fact is realized. The degree of efficiency and economy is dependent entirely upon the care given the equipment and the manner in which the vehicles are operated.

Operating efficiency aims to get the most out of the equipment; it represents the prime purpose of the vehicle, which is to carry the load over a certain distance in a certain time. The more the equipment is kept in service the greater the operating efficiency.

Efficient maintenance is the means whereby this operating efficiency is maintained continuously instead of occasionally and if we are to have as our goal a system of preventive maintenance which will eliminate mechanical road delays, we must adhere to these fundamentals. Performance and economy of operation alone do not suffice to give efficient transportation, for such operation must not be interrupted and equipment should be ready for service at all times.

What underlies sound maintenance? How long will a piece of equipment last? What is its ultimate life? Is it one day or can we measure it in years? This question cannot be answered in terms of a definite period of time.

On one hand there is the fleet operator who operates his equipment with the sole idea of getting through with the job whether it is in a day or in months. This type of operator, without regard to the care and attention which the vehicle should receive, drives it to the ultimate scrap-heap at the end of the season.

On the other hand, there is the type of operator who believes in preventive maintenance, who adheres strictly to an inspection system and who demands at all times that his equipment, whether it is portable or mobile, receive the attention that it should have.

It has been the aim of the manufacturers, particularly of commercial vehicles, to build long life into the vehicle. Proper maintenance naturally retards depreciation. We cannot answer the question "How long will a truck or bus last" except by "THAT DEPENDS". It depends to a considerable extent on the quality of the vehicle, somewhat on the work it is called upon to perform, the way in which it is handled and the maintenance it receives. I know of no word, other than "MAINTENANCE" which describes "Care."

Preventive Maintenance means searching for troubles while they are still small in order to cure them before they become big. What then, is more important and essential than the upkeep of automotive equipment?

EDW. C. WOOD,
(Major Wood to you), whose articles on Fleet Maintenance have appeared in this publication from time to time. This month he takes some old proverbs and shows how you can adapt them to your particular fleet operation.

Inspection. A study of the problems of Preventive Maintenance in line with elimination of mechanical road delays, reduces itself to "an ounce of prevention." The fleet operator will do well to face the problem as it is but it need not cause him undue alarm for he will see, if he looks around, equipment that is poorly cared for, giving good service for from three to five years. The modern truck or bus will stand tremendous abuse but, consider the additional years and continuity of service which can be added to its life by a strict inspection system and proper maintenance. There is no question but that the vehicle's depreciation curve can be straightened considerably and additional years of life obtained.

No better motto than the old saying "A stitch in time saves nine" could be found to express the spirit and purpose of a proper system of maintenance. Catch a squeak while it *is* a squeak and remove the cause before it has developed into a condition that requires a considerable number of man-hours to remedy. TO CORRECT, is the essence of the problem.

As it is generally harder to diagnose an ailment than to prescribe for it once its nature is known, so in the care of the motor vehicle, the most difficult work is not the actual maintenance but the inspection which reveals what parts are in need of immediate attention and from what parts the maximum life has not been obtained.

The progressive type of fleet operator would not allow

In Which Our Mutual Friend, Ed. Wood, Takes Some "Vague Generalities" and Adapts Them to Practical, Present-Day Fleet Operation

In Ebonite and BLACK-GOLD

» » in these two new-type linings are forecast the basic structures of future brake linings

Before Ebonite the cry was, "More Asbestos." Manufacturers vied among themselves to produce the brake lining with the highest asbestos content. Reversing this trend Ebonite demonstrated the decided advantages of low asbestos and high mineral content, that stopping power was dependent upon compounds, that by increasing minerals (heat conductors) and reducing asbestos (heat insulator) most serious brake troubles could be avoided.

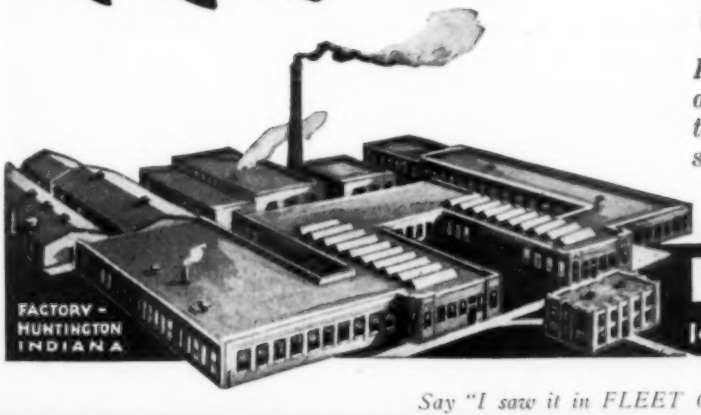
This departure from the old rule-of-thumb has been carried still farther by the Miley Laboratories in BLACK-GOLD, the soft-pedal, non-scoring full molded. These two new structures have made possible *closely controlled friction* and *constancy of braking quality* regardless of degree of wear.

So outstanding has been the performance of these two linings that many other linings now claim similar structures and ape Ebonite or BLACK-GOLD in appearance—by getting blacker and blacker they imply that they too have the soft-pedal, smooth action and extra milage of Miley linings.

Ebonite and BLACK-GOLD quality is more than skin deep. It does not wear off with the surface. It is built into these two outstanding linings by patented process with special machinery. Literally there are no other linings "like" them, and if you have not tried them you have a new experience ahead.

Test these Linings for yourself

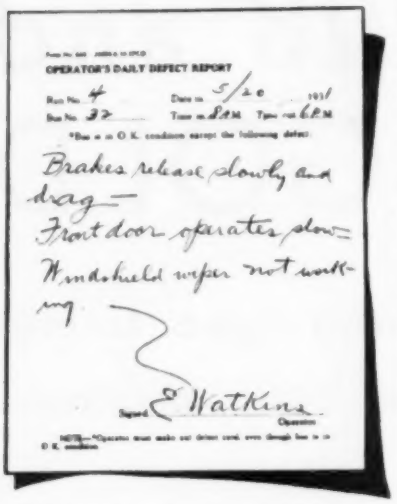
If you are rated, just write for a test re-line for any car, bus or truck. If it doesn't give you better brakes in every way and more miles per dollar, send it back for credit.



L.J. MILEY COMPANY
INCORPORATED
1466 S. Michigan Avenue, – Chicago, U.S.A.

Say "I saw it in FLEET OWNER"—It Helps!

A STITCH IN TIME DOES SAVE NINE (*Continued*)



OPERATOR'S DAILY DEFECT REPORT

Run No. 4 Date 5/20 1931
Bus No. 32 Time 8 A.M. Time 4 P.M.

*Bus is in O.K. condition except the following defect:

Brakes release slowly and drag—
Front door operates slow—
Windshield wiper not working

Signed E. Watkins
Operator

NOTE—*Operator must make out driver card, even though bus is in O.K. condition.

The driver's report, such as this one, is very important. It is the first step in search for mechanical troubles.

a mechanical trouble to go unattended, provided he knows the trouble exists. Yet, how many mechanical ailments develop into serious troubles before they come to the attention of the fleet operator? In the maintenance of a truck or bus, the work of repairing, replacing or adjusting is secondary to the inspection which discloses what parts are in need of attention and therefore, inspection is the basis of vehicle maintenance, and to my mind, preventive maintenance is in direct line with elimination of mechanical road delays.

The first step in constant search for mechanical troubles is the cooperation of the driver, who may know little or nothing about the construction of the vehicle, but is in an excellent position to report on its general behavior. He is operating the vehicle during the day under all conditions, and troubles or symptoms of troubles come to light on the road, which might remain hidden in an inspection at the garage.

The report of the driver is at times very important, but is in a sense, incomplete. It may reveal troubles which might otherwise not have been caught until a very much later date, but it is sure to omit mechanical failures which only a minute examination can bring to light. An inspection is required from time to time to safeguard the condition of the vehicle. This is the responsibility of the garage.

How often should these inspections take place and how complete should they be? Once more, the circumstances around each installation must be looked into before an answer can be given. The owner of a fleet of trucks or buses can employ one or more skilled mechanics and set aside a certain period for each vehicle to be taken off the road and given a thorough inspection. Some inspections are made once a month on a time basis; others on a mileage basis and still others on the operating conditions involved.

Although a mechanic may be able to inspect a vehicle without the aid of an inspection sheet, experience indicates some such form *is essential.* A well designed inspection sheet should list the important parts of the vehicle by grouping them according to the system to which they belong, or in the order in which they are reached by the mechanic as he progresses in the examination of the vehicle from one end to the other.

Reliability is perhaps the most valuable asset that a fleet operator should have in his fleet. There has been considerable work accomplished in the past in an endeavor to secure the highest load factor of the equipment with minimum capital expenditure. Very few however, are successful because by the time the symptoms of impending failure are detected the damage is done. Behind these failures is the incapacity of the maintenance organization to correctly diagnose the condition of the equipment.

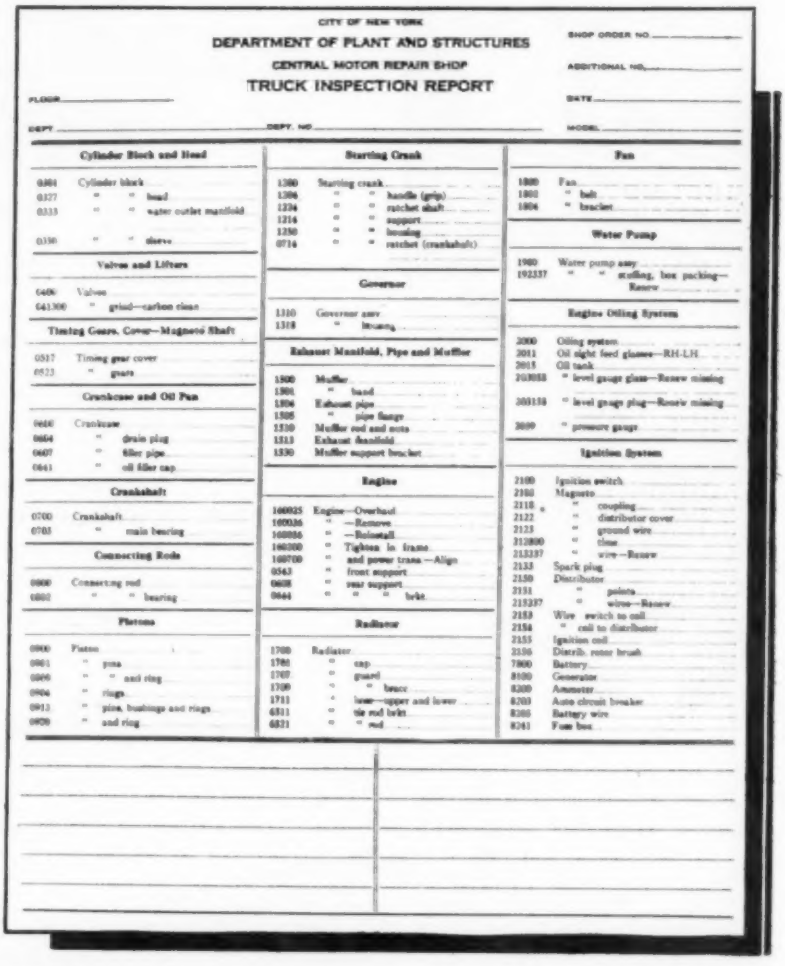
That brings us to the point "How far can diagnosis be carried without stripping down the chassis"? Various surveys made from time to time prove without a doubt that the preventive way is, in the last analysis, the cheapest way. This can only be attained by a new development in fleet operation, particularly that of trouble shooting technique.

Complete Overhaul versus Partial Overhaul. Some fleet operators, in order to guarantee continuity of service of their equipment, lay up their vehicles once a year and subject them to a thorough overhauling in every detail. The smallest defect is remedied, new parts supplied, etc.

Of late years, we find that a change is taking place and that fleet operators are going to partial overhauls at no specified time. They are endeavoring to get the maximum life out of each part.

To my mind, the determining factor in these two theories reduces itself to the thoroughness of the inspection. If the operator relies on rigid inspection at

(*Please turn to page* 44)



CITY OF NEW YORK
DEPARTMENT OF PLANT AND STRUCTURES
CENTRAL MOTOR REPAIR SHOP
TRUCK INSPECTION REPORT

SHOP ORDER NO. ____ ADDITIONAL NO. ____
FLOOR ____ DATE ____
DEPT. ____ DEPT. NO. ____ MODEL ____

Cylinder Block and Head
0301 Cylinder block
0327 " " head
0333 " " water outlet manifold
0330 " " sleeve

Valves and Lifters
0406 Valves
041300 " grind—carbon clean

Timing Gears, Cover—Magneto Shaft
0517 Timing gear cover
0523 " gears

Crankcase and Oil Pan
0600 Crankcase
0604 " drain plug
0607 " filler pipe
0641 " oil filler cap

Crankshaft
0700 Crankshaft
0703 " main bearing

Connecting Rods
0800 Connecting rod
0803 " " bearing

Pistons
0900 Pistons
0901 " pins
0905 " " and ring
0904 " rings
0912 " pins, bushings and rings
0920 " and ring

Starting Crank
1200 Starting crank
1204 " " handle (grip)
1234 " " ratchet shaft
1216 " " support
1250 " " housing
0714 " " ratchet (crankshaft)

Governor
1310 Governor assy
1318 " housing

Exhaust Manifold, Pipe and Muffler
1500 Muffler
1501 " head
1504 Exhaust pipe
1505 " pipe flange
1510 Muffler end and ears
1513 Exhaust manifold
1530 Muffler support bracket

Engine
160025 Engine—Overhaul
160026 " —Remove
160036 " —Reinstall
160300 " Tighten in frame
160700 " and power trans—Align
0543 " front support
0608 " rear support
0644 " " brkt.

Radiator
1700 Radiator
1701 " cap
1707 " guard
1709 " " brace
1711 " lower—upper and lower
6831 " tie rod brkt.
6821 " " rod

Fan
1800 Fan
1801 " belt
1804 " bracket

Water Pump
1900 Water pump assy
192337 " " stuffing, box packing—Renew

Engine Oiling System
2000 Oiling system
2011 Oil sight feed glasses—RH-LH
2015 Oil tank
203033 " level gauge glass—Renew missing
203133 " level gauge plug—Renew missing
2039 " pressure gauge

Ignition System
2100 Ignition switch
2102 Magneto
2118 " coupling
2122 " distributor cover
2123 " ground wire
312800 " timer
213237 " wire—Renew
2133 Spark plug
2150 Distributor
2151 " points
213237 " wires—Renew
2153 Wire switch to coil
2154 " coil to distributor
2155 Ignition coil
2156 Distrib. rotor brush
7800 Battery
8100 Generator
8200 Ammeter
8203 Auto circuit breaker
8205 Battery wire
8241 Fuse box

Although a mechanic may be able to inspect a vehicle without the aid of an inspection sheet, experience dictates that some such form is essential. The one shown above comes in the form of a four-page folder. Note the operation number, preceding each part.

Downstairs in your cellar

you'll discover an economy secret for your fleet!

DOWNSTAIRS in your cellar a modern heating plant keeps your house always comfortable—whatever the changes in weather. Is the outside temperature falling? Automatically, by means of thermostatic control, your furnace sends up more heat into the house. Is the temperature climbing again? Automatically the heat shuts off.

Think what it would mean to the electrical system on your buses or trucks, if you could have such super-human control of the amount of current flowing into the batteries.

Never again would your batteries be persistently overcharged . . . causing the water in the battery to boil . . . the plates to buckle . . . the separators to deteriorate . . . the battery to be ruined!

Never again would your batteries be habitually undercharged, causing plates to become sulphated, reducing the capacity of the battery until eventually it takes no charge at all and is ruined.

An Amazing Generator

In the same way that a modern heating plant controls the heat supply in your house, the Bosch Volt-O-matic Generator automatically regulates the supply of current produced, as needed by the battery.

Is the battery draining fast? Automatically the Bosch Volt-O-matic Generator puts a heavy charge into the battery. Is the battery already full? Automatically the current supply is cut down.

Such complete regulation makes a world of difference in your operating and maintenance costs. Road breakdowns caused by otherwise unavoidable battery abuses are prevented. Battery repairs and premature replacements, caused by overcharging or undercharging, are eliminated. Since the battery is always well charged, your starting motor cranks the engine at high speeds, and assures you of a powerful starting spark.

And this is not all. The Bosch Volt-O-matic Generator is deliberately designed so that when the engine is running, the generator itself and *not the battery*, carries the load of all current consumers. Result: Still greater savings in maintenance costs. You can use a smaller sized, hence lower priced battery. Your lamps can not burn out from sudden excessive voltage, nor blow out from broken wires or corrosion of battery terminals.

New Low Prices

Prices on the most popular types of Bosch Volt-O-matic Generators, both for heavy duty and lighter duty service, have just been reduced up to $26. If you have been searching for new ways to cut your operating cost-per-mile, mail coupon now.

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AMERICAN BOSCH SALES & SERVICE

WRITE NAME AND ADDRESS IN SPACE BELOW

This Business of

Motor Vehicle Fleet Operation

By E. E. La Schum,

Manager, Automotive Department, Railway Express Agency, Inc., New York City

Article III—When to Retire the Old Gas or Electric Truck?

AND now we come to the time-honored subject: When to retire a truck? Every truck operator wonders if he should use a truck a few years and then trade it in, or should he get as many years' life out of it as possible?

We all prefer a new truck to an old one, but must consider the expense. I would like to submit for your consideration a method for determining just when a truck should be retired.

The data presented is all based on our experience in New York City, although for obvious reasons I do not show actual costs. These figures are based on a fleet of 376 3½-ton gasoline trucks and 193 3½-ton electrics all averaging 14 hours of service per day.

First let me show you how repair costs increase as a truck becomes older—see Chart B.

Notice that repair costs increase at practically a constant rate each year if overhauls are averaged over the life of the truck. It is not fair to charge an overhaul against the third year of a truck's life when the repairs were made necessary by the work done during the first three years. By the time the gasoline truck is 8 years old, the cost of chassis repairs has more than tripled.

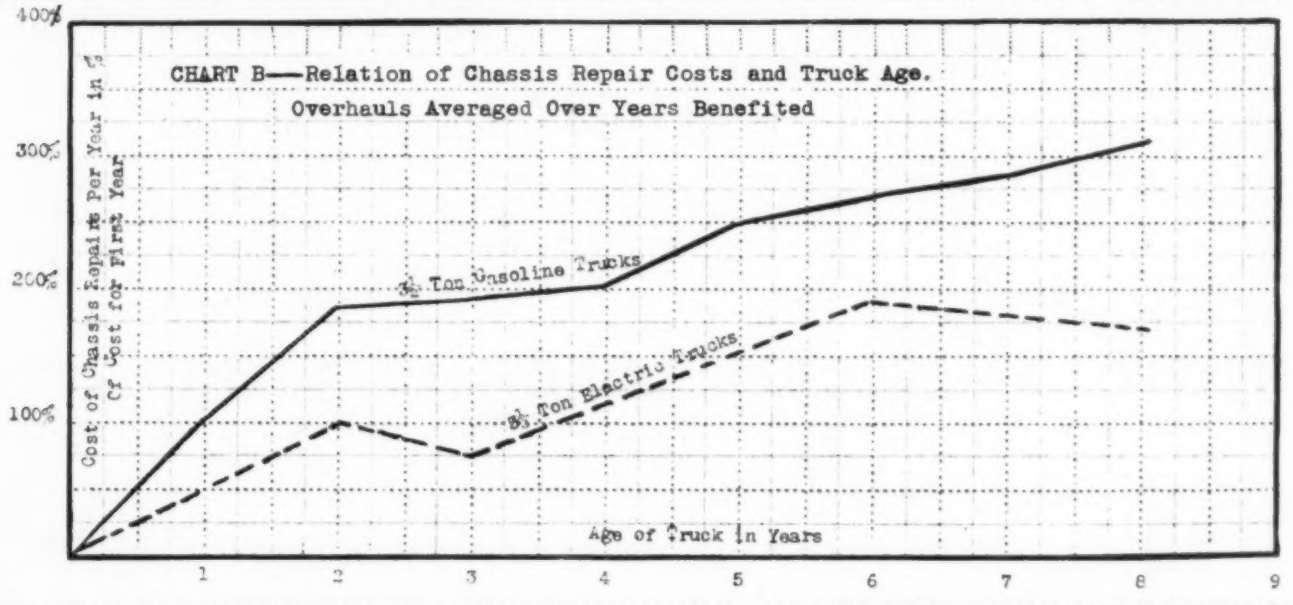
Repairs to the electric increase with truck age until the sixth year and thereafter fall off.

Running repairs and overhauls to the same trucks are separated in Chart C. The gasoline trucks were overhauled in the third, fifth and seventh years and the electrics in the fourth and seventh years. The last overhaul to the gasoline trucks was about twice as expensive as the first two. Strange as it may seem, running repairs remain fairly constant after the third year in the case of the gasoline truck.

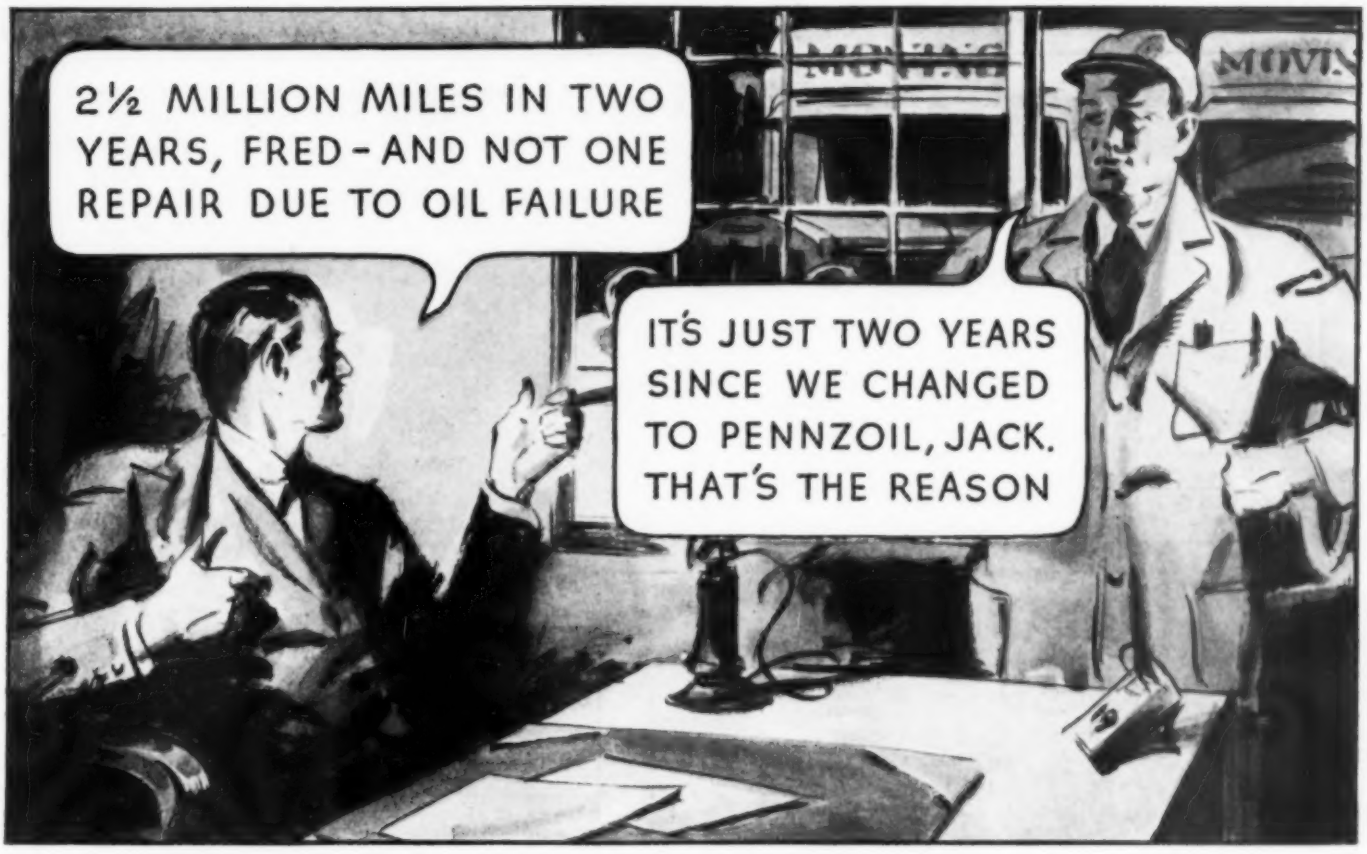
Now comes the question of "When to retire a truck"? In the case of an electric truck, inasmuch as repairs do not increase after six years of life, the truck need not be retired unless it becomes obsolete.

But the same thing is not true for the gasoline truck. To answer our question we must know whether it is cheaper to buy a new truck or keep on repairing the old one. We must, therefore, consider two factors—the first cost or purchase price of the truck and the cost of all repairs—chassis, body and painting—for each year of life.

(*Please turn to page following*)



A Series of Practical Fleet Maintenance Articles Prepared from a Paper Recently Read Before the S. A. E. Transportation Meeting


2½ MILLION MILES IN TWO YEARS, FRED - AND NOT ONE REPAIR DUE TO OIL FAILURE
IT'S JUST TWO YEARS SINCE WE CHANGED TO PENNZOIL, JACK. THAT'S THE REASON

ANOTHER LARGE FLEET OWNER CUTS COSTS WITH PENNZOIL

Again proves Pennzoil's greater safety and economy— Shows how every fleet owner can increase profits

Lower maintenance costs—longer mileage from oil and engines—less time lost for service—one large fleet operator after another is getting these savings with *Tough-Film* Pennzoil, and proving it by actual records of costs.

The Star Transfer Line of Grand Rapids, Michigan, writes, "Our total fleet mileage for the past two years is about 2,500,000 miles. Our trucks are lubricated with your oil, and our service records show that we have never had any expense due to faulty lubrication."

Similar experiences are reported by other fleet operators all over the country. One large contracting company reports 50% lower oil consumption since changing to Pennzoil. A motor coach company reports 62% less oil consumption, and maintenance costs lower than before. A truck transportation system writes that maintenance costs have been cut 50% with Pennzoil.

You can cut operating costs on your own fleet the same way. *Tough-Film* Pennzoil definitely cuts oil consumption because it's double-refined for toughness from pure Pennsylvania crude. It definitely cuts operating costs and reduces repairs because of its extra toughness. It provides a better piston seal, reduces oil drag, and increases power.

Get the actual facts on oil performance. Let cost records of large fleets in your own business prove what Pennzoil can save you. Fill out and mail the coupon now for complete information.

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Without obligation, send me the facts on how *Tough-Film* Pennzoil can save me money.

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WHEN to RETIRE THOSE OLD TRUCKS? (*Continued*)

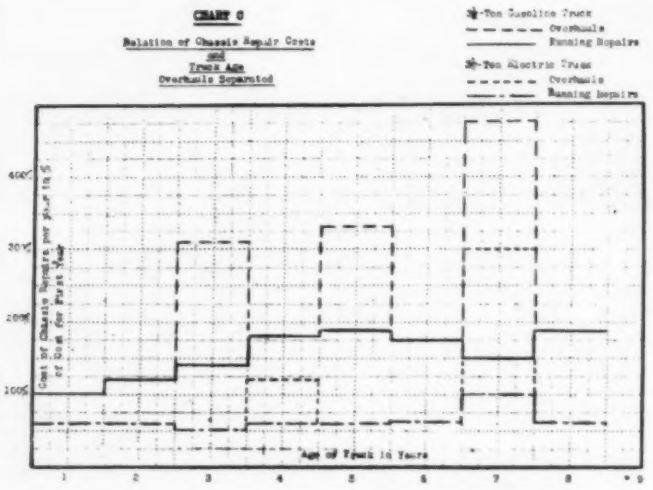
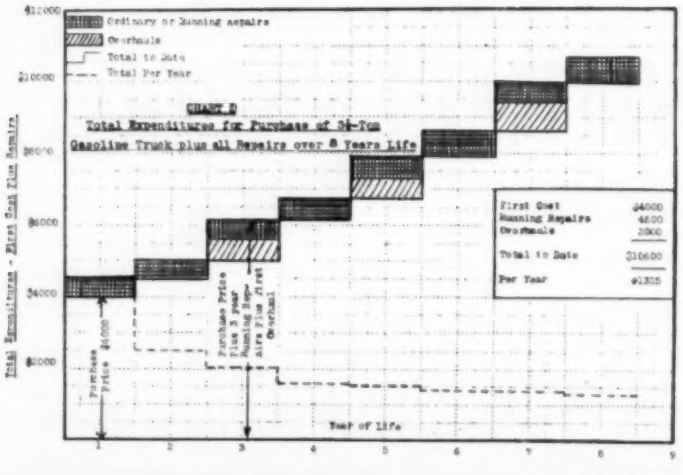


CHART C
Relation of Chassis Repair Costs and Truck Age Overhauls Separated
3½-Ton Gasoline Truck
Overhauls
Running Repairs
3½-Ton Electric Truck
Overhauls
Running Repairs
Cost of Chassis Repairs per year up to end of Year for Part Year
Age of Truck in Years

The following figures, I believe, are typical for 3½-ton to 5-ton trucks used in city hauling:

Yr. of Truck Life	First Cost of Truck	All Repairs Except Overhauls	Overhauls	Total of All 3 Items	Average Cost Per Year
1	$4000	$450		$4450	$4450
2		550		5000	2500
3		550	$600	6150	2050
4		600		6750	1688
5		600	600	7950	1590
6		650		8600	1434
7		550	800	9950	1421
8		650		10600	1325
Totals	$4000	$4600	$2000	$10600	


Ordinary or Running Repairs
Overhauls
Total to Date
Total Per Year
CHART D
Total Expenditures for Purchase of 3½-Ton Gasoline Truck plus all Repairs over 8 Years Life
Total Expenditures - First Cost Plus Repairs
First Cost $4000
Running Repairs 4600
Overhauls 2000
Total to Date $10600
Per Year $1325
Purchase Price
Purchase Price plus 3 year Running Repairs plus first Overhaul
Year of Life

These figures are shown graphically in Chart D. The total expenditure for the truck itself and repairs climb to $10,600 by the end of 8 years. The average cost per year, however, drops rapidly until the end of the fifth year and thereafter is fairly constant.

One immediately asks himself the question, "Why not trade the truck in after its fifth year?"

Chart E is the answer. If the truck is to be retired at the end of the fifth year, it certainly will not be overhauled the same year. Furthermore, running repairs will be only sufficient to keep the truck on the street. Both chassis and body will be allowed to wear out completely.

As a result we find that the average cost per year is $1400 at the end of the fifth year as compared with $1325 at the end of the eighth year.

The small difference of $75.00 would be more than offset by the difference in trade-in value and the superiority of a new truck over an old one.

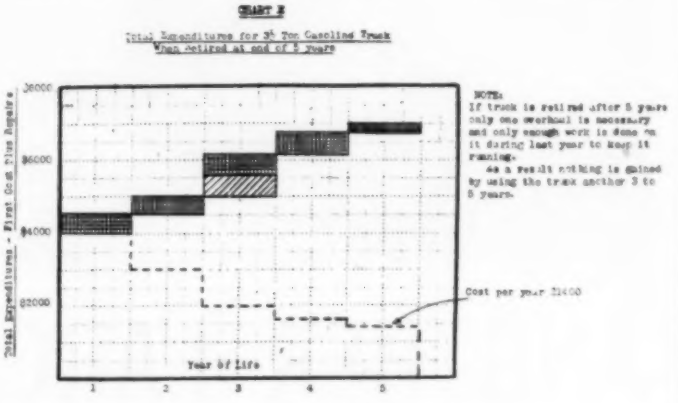


CHART E
Total Expenditures for 3½ Ton Gasoline Truck When retired at end of 5 years
Total Expenditures - First Cost Plus Repairs
NOTE:
If truck is retired after 5 years only one overhaul is necessary and only enough work is done on it during last year to keep it running.
As a result nothing is gained by using the truck another 3 to 5 years.
Cost per year $1400
Year of Life

I have thought that you who read this paper may be interested enough to apply this method to your own costs. It is a subject worth serious study.

Might I emphasize one more point. In preparing an operating statement, simplify it. The following should be shown:

How many trucks are in operation; and what they cost.

What the present annual replacement bill averages.

What saving you estimate can be made on it.

Show what the cost of operation is. If you show it in ton miles, explain just what that means.

Chart the present organization; and against it, place the reorganization chart, showing what and where changes need be made. (*To be continued*)

THERE IS ONLY ONE BRAKEBLOK MATERIAL—AMERICAN BRAKEBLOK

American Brakeblok is Made in One Grade Only • It is the Same in Every Form

AMERICAN BRAKEBLOK is an exclusive material, *manufactured only by the American Brake Materials Corporation,* and in one grade only. It is available in types for every car, bus and truck. The material is basically the same in every form—there can be no second grades of American Brakeblok. Here are the exclusive advantages of American Brakeblok:

PERFORMANCE: Quicker stops—smoother stops—complete absence of grabbing—constant renewal of braking surface—does not swell—does not "burn out."

PHYSICAL CHARACTER: A dense homogeneous solid—the same clear through—formed under pressure—scientifically heat treated—ground to uniform thickness—contains no rubber. Supplied in Rolls, Keeper-Type, Full-Coverage Sets and Bolt-On Full-Coverage Type.

INSTALLATION: Quick, easy installation—replaces any other lining without change in brakes or methods—strong alloy-mesh backing permits deep counter-sinking of rivets for uniformly satisfactory results.

ECONOMY: Greater thickness of usable material gives longer service life—requires far less adjustment than ordinary linings, thus reducing maintenance expense.

Leading truck and bus manufacturers use American Brakeblok as original equipment, and many of the largest fleet operators install it exclusively as a replacement.

Write for complete information on any type of installation in which you are interested.

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Say "I saw it in FLEET OWNER"—It Helps!

Some Notes on

High-Tension Cable

Wherein We "Shoot Full of Holes" the Old Theory That Spark Plug Wires Are O. K. Until They Absolutely "Do Not Choose to Run"

By H. Clay Fischer

RECENTLY, as you will undoubtedly recall, our "Question-of-the-Month Club" covered the subject of ignition cable. Tabulated reports were sent to those readers participating in the survey and several of the most interesting answers were published in full in our February issue, for the benefit of those who may have been interested in the subject, but just did not get around to filling in and mailing the question-blank back to us. However, we hope you found it interesting.

One of your Editor's findings, as a result of this particular survey, was very interesting, inasmuch as it revealed that practically all of the answers stated that "cable is selected by testing" either on vehicles in actual service or in the "laboratory." All of which is just as it should be, save for the fact that many fleet maintenance men are still in the dark as to what constitutes a good test, aside from the time-honored method of getting a sample set, installing it on a vehicle and then waiting a year and a half for it to wear out.

However, let us go back to first principles and review the important functions of ignition cable, its effect on the general performance of the vehicle and the reasons why it should have a better share of your attention.

Ordinary high tension cable (spark plug wires, to you) deteriorates in service very rapidly, and with far reaching results, particularly on those installations that are known to be unusually tough on spark plug wires, such as overhead-valve jobs, oil splashers, etc. Where cheap, rubber-covered cable is used, the rubber insulation is quickly attacked by oil, grease, heat and moisture and the vibration, abrasion and corona effect which is always present in high tension cables soon make their effects noticeable in the engine's performance. Ignition cable that is old, frayed, grease and oil-soaked, can be likened to an old, leaky rubber hose; it will leak its current just as an old hose leaks water.

In this connection, the wiring system of a car might be compared with the blood veins, nerve and muscular system of the human body. The blood veins carry the blood to all parts of the body that require it and the nerve and muscular systems control the action of the various parts of the body. In like manner the electric wiring of an automobile carries the flow of current through the electrical system of the car.

If the nervous system of the body is damaged we all know that there will be trouble. And the same is true with the wiring in an automobile. Should the wiring in any way become defective, consequent trouble will arise in the car through the loss of the proper flow of electric power.

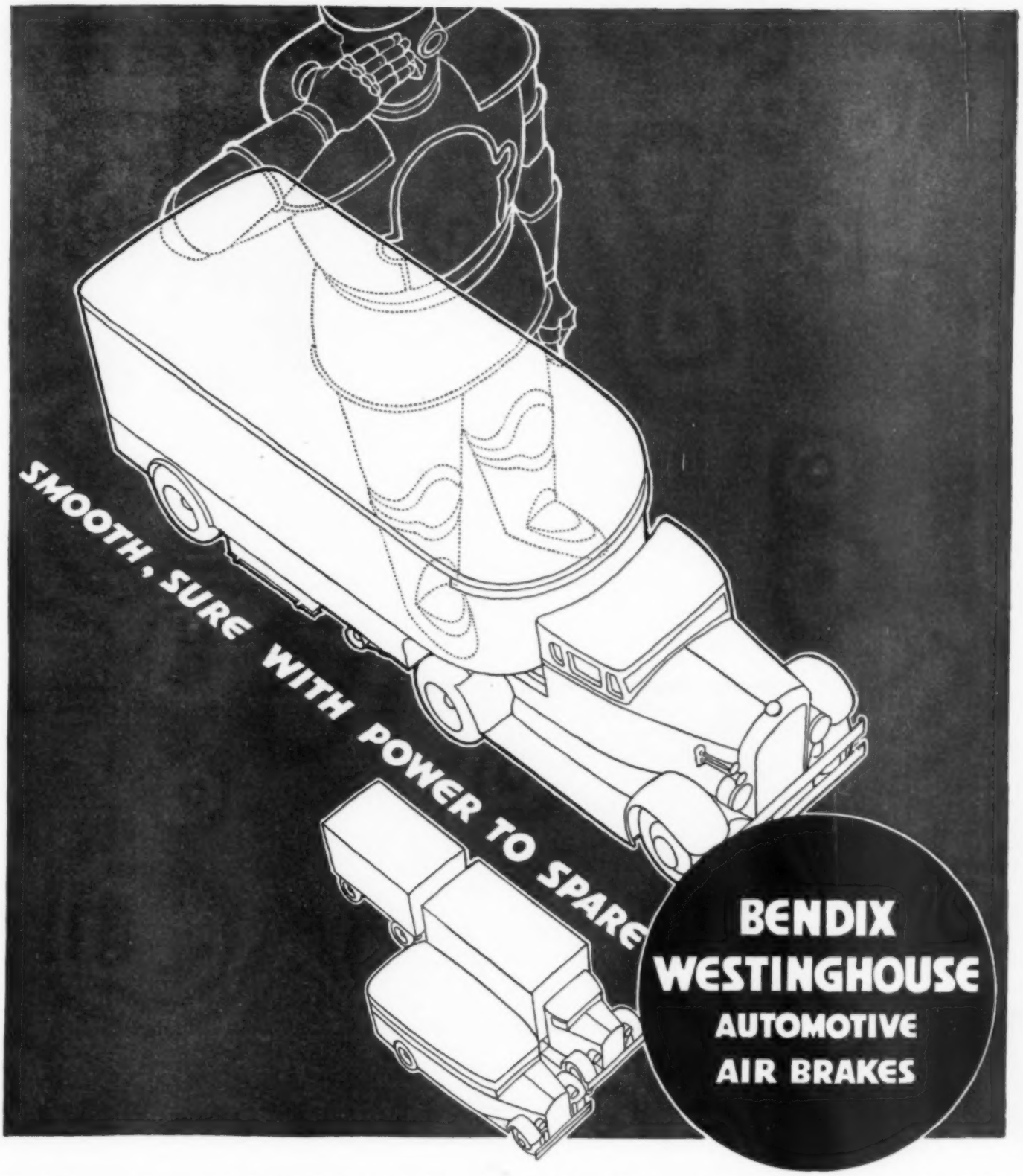
High tension ignition cable carries the high voltage to the distributor and to the spark plugs. If the proper voltage is not delivered to the plugs, the explosion will not occur or will be delayed, and the full power of the engine will not be developed. With the higher compression engines of today, higher speeds, more powerful coils and more powerful engines, the voltage required to jump the spark plug gap is consequently greater. Therefore, there is a greater tendency for the wire to leak current and cause irregular firing, resulting in lost efficiency in the engine.

Another factor to be contended with is called corona. Corona is the name of an electrical phenomenon which takes place when a high voltage (10,000 volts or more) is carried by an insulated conductor. It manifests itself by a purplish glow, visible at night along the surface of the conductor and is more prevalent when the conductor is close to a grounded metal part of the car. This corona action breaks down the surrounding air and liberates free ozone, which is a deadly enemy of rubber, causing it to crack and permit current leakage.

From the above photo it looks like the progressive municipality of Flint, Mich., pays proper attention to the spark plugs and ignition cables of the police cars in its fleet.

There are a great many symptoms of defective cable. The necessity for advancing the timing of the ignition sometimes indicates leaky high tension wires, which produce the same effect as retarding the spark, thus making the adjustment necessary,

(*Continued on page* 45)



Smooth—because they carry perfectly controlled, automatically equalized power direct to each braking wheel . . . Sure—due to the fact that their design follows closely the positive operating and automatic emergency features of the universally accepted Air Brake, whose very name spells safety wherever rails have been laid . . . Bendix-Westinghouse Automotive Air Brakes function always, with power to spare. A traditional feature of genuine Air Brake Control, this abundant power is more than a margin of safety. It is important and practicelly unlimited in its use as a safe, efficient control for trailer brakes. Placing an entire train under instant, effortless control as a unit or, actuating trailer brakes independently, through the new Bendix-Westinghouse, hand-operated, Trailer Control Valve—Air Brakes again demonstrate their marked superiority ★ Requests for information regarding any phase of this recognized, World Standard Brake Control are invited.

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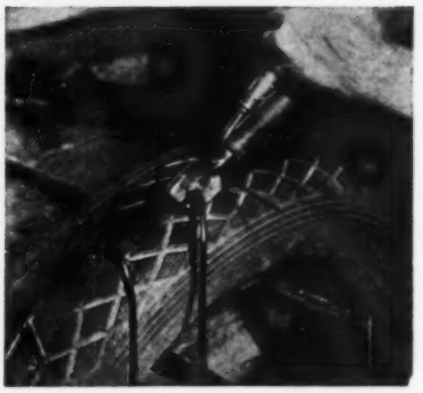
Say "I saw it in FLEET OWNER"—It Helps!

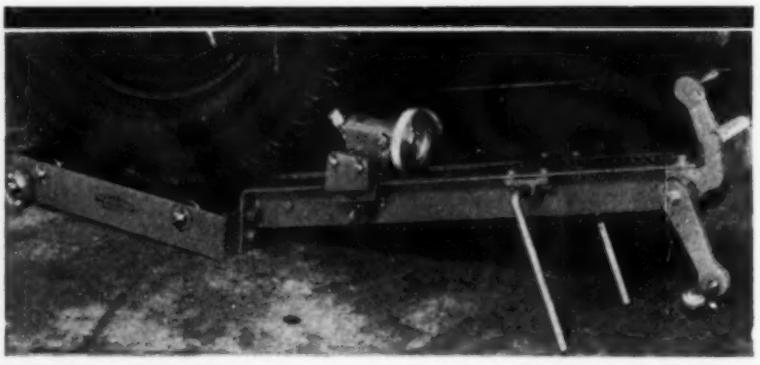
Tire Re-Grooving as a Safety Measure



"Groove If You Must That Old Bald Head" But Don't Forget That New Rubber Protects Against Blowouts as Well—Here's the Regrooving Story:

WITHIN the last few years, (although it seems almost overnight) the practice of pneumatic tire regrooving has become adopted by fleet operators everywhere. Of course, the general principle of tire regrooving is not new, having been practiced on solid tires for many years back. Various methods have been used, including pneumatically-operated chipping hammers, "hot-knives," branding-irons and even the almost extinct straight-blade razor. But not until recently has the practice of regrooving pneumatics become widespread.

In the privately-owned passenger car field, the regrooving of "bald-headed" tires is perhaps a product of the depression, caused by the need of more economy on the part of the average individual car owner.



One type of regroover that does the job without removing the tire from the vehicle. The cut shown in the heading is of the "hot-knife" that can follow the original tread design.

But in our field—
—the fleet field—we venture to state that the practice has developed largely as a safety measure, because skidding is perhaps more prevalent on smooth tires than on those having a well-defined tread. We cannot too strongly emphasize the value of this practice, and would rather do it on the basis of its value as a safety measure. The Lord knows, there are already too many economy measures being practiced, and far be it from us to urge you to deprive the boys in the tire game of an extra order or so.

Pull out your December issue of FLEET OWNER and on page 37 you will find the following data on this subject: (We'll print it again for your convenience.)

"A car equipped with new tires, or with old tires which still leave a sharp non-skid impression, can be stopped from a 30-mile-an-hour speed on wet asphalt in 51 feet. These tires have 100 per cent rating of driving safety.

"A car equipped with tires that leave an impression which is smooth in the center and non-skid on the edges can be stopped from a 30-mile-an-hour speed on wet asphalt in 74 feet. These tires, which require an additional 23 feet to bring the car to a stop, have a safety rating of only 55%. They do not offer security.

"A car equipped with tires which are completely bald and leave a smooth impression from edge to edge can be stopped from a 30-mile-an-hour speed on wet asphalt in 76 feet—provided the car does not hit something first. These tires, with only 51 per cent safety rating, are very dangerous."

If new tires are "out of the question" as it is sometimes evasively expressed, regrooving, for safety's sake should be the next step. Your insurance officials will be pleased; the National Safety Council will undoubtedly approve and your drivers will like it, too.

However, it must not be lost sight of, that there is one thing that regrooving will not do. And that is give protection against blowouts. If the casing is "all shot", regrooving is not recommended. It is only considered sound practice where the tire is in otherwise excellent shape, has sufficient rubber on the tread to withstand regrooving, and still has some of the original mileage built into it by the tire manufacturer. Then regrooving is o. k. If the tire is "gone" in places and the fabric or carcass is ruptured, give the tire salesmen a break, and forget the depression.

And now as to something about the regrooving apparatus itself. There are several makes and types on the market, ranging from the inexpensive hand tools (the success of some depending upon the skill of the operator) to the more elaborate, expensive power-driven models.

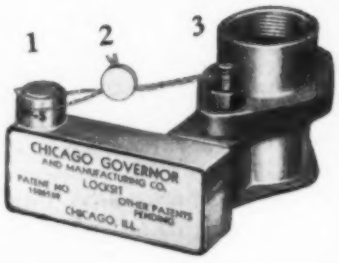
The most popular, to our mind, are either those that can do the job in a few minutes while the wheels are still on the vehicle, or those that can follow the original tread design of the tire, on or off the rims; inflated or deflated. Shut your eyes and take your pick, if you will. While it is said that there seems to be little demand for any other type of cut than the circumferential, since a car seldom skids other than sideways, we

(*Please turn to page* 46)

Announcing NEW LIST PRICES for CHICAGO GOVERNORS

CHICAGO LOCKSIT
$12.50

CHICAGO SCREW-SEAL
$11.50



3-point protection

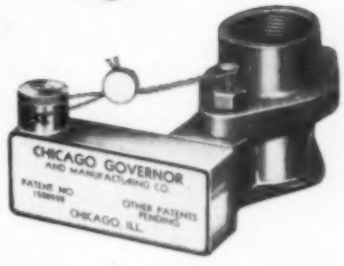
CHICAGO LOCKSIT GOVERNORS are: (1st) Key Controlled; (2nd) A Seal Wire passes through both lock and stud making the use of a duplicate or master key futile; (3d) This same seal wire seals the governor to the manifold preventing the removal or blocking of governor.

Only this 3-point LOCKSIT protection assures proof "beyond question of doubt"—is absolute protection against tampering. *Write for discounts.*

Accurate, Dependable and Tamper-proof *in fact*

CHICAGO GOVERNORS will pay a profit on any fleet for they control speed accurately — are *guaranteed* to control both engine and traveling speed under all loads for the life of the engine. Should a CHICAGO GOVERNOR fail at any time it will be replaced (not just repaired) without charge.

CHICAGO GOVERNORS can be depended on for they are tamper-proof not only in theory but in fact. They fit 93% of all makes and models of cars, buses and trucks without extra fittings.



The CHICAGO SCREW-SEAL Governor, while not the cheapest governor sold is most certainly the greatest governor value—carries the lowest prices of any standard make governor. Adjustment for speed is made with convenient thumb screw—there is no need for screw driver or other special tool. Adjustment is protected by seal wire that passes through thumb screw and stud and also seals governor to manifold. All working parts are permanently enclosed. *Write for discounts.*

CHICAGO GOVERNORS *Save*

- 20% Gasoline
- 40% Oil
- 40% Repairs
- 45% Tires and Brakes
- and *Eliminate the cause of 65% accidents*

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Make and Model Car .....

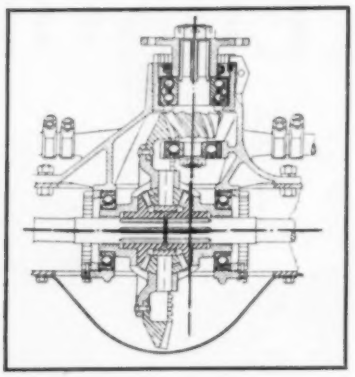
Firm Name .....

Address .....

City ..... *Signed* .....

Say "I saw it in FLEET OWNER"—It Helps!

Simplifying *those* Rear - End Jobs



When Ring-Gear Teeth Lose Their Bite, Here's How to Accurately and Quickly Replace Them, Making Use of Your All-Purpose Shop Lathe

By J. H. Sheehan

WHILE a rear end job doesn't come up in the fleet maintenance shop as frequently as valve, piston, cylinder and brake reconditioning, one nevertheless does occur with relentless regularity and generally causes a "lay-up." That's what differential trouble seems to do in most company-owned repair shops.

The most frequent cause of trouble is the ring-gear becoming "toothless." And when teeth break on the ring-gear the result is usually a distorted case flange also—which will not permit the "slapping-on" of a new ring-gear, as it cannot run true when mounted out-of-true.

The other cause of trouble is a damaged pinion. However, when either pinion or ring-gear need replacing, ***both must be replaced.*** A pair mated by the manufacturer should be put in, and then good performance is insured. None but mated gears will perform most efficiently.

To handle a ring-gear replacement job properly calls for accurate testing and accurate machining. This can be done if the assembly is properly set up between centers in the shop lathe—the same accurate method as is used in manufacturing and assembling the differential units. (Every properly equipped shop should have a lathe. — Editor.)

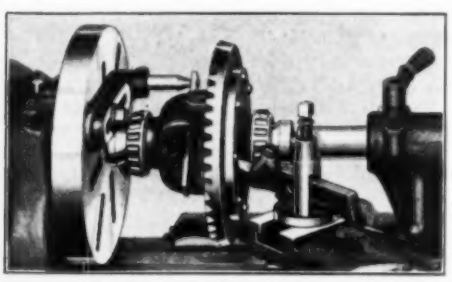


Fig. 2—Cutting off the rivet heads in this manner does not damage the trueness of the case.

The only equipment needed in addition to the lathe are a 60° large diameter live center for headstock mounting, a 60° large diameter dead center for tailstock mounting, a face plate driver and a pin for driving the work. This equipment is inexpensive and, by having three or four driving pins of different lengths (which you can make yourself out of cold rolled steel), you will be able to handle any differential which happens to need a new ring-gear. (If the mechanic has the time, he can also make up the pair of large centers without any difficulty.)

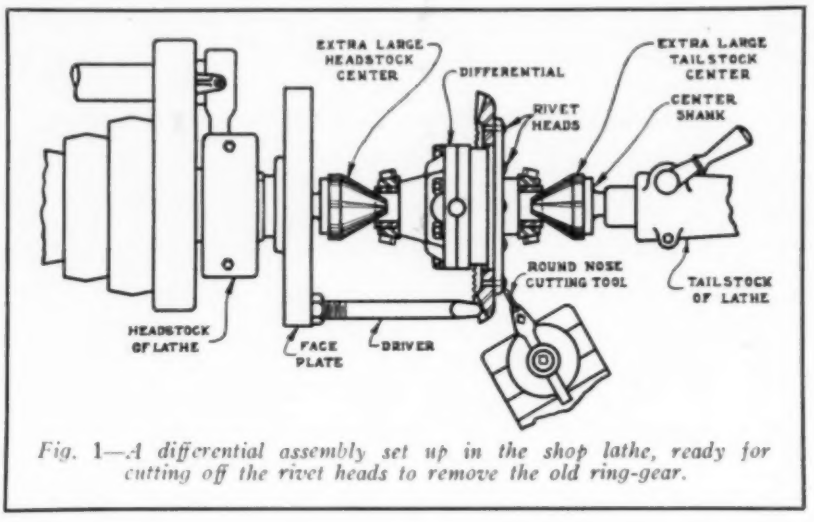


Fig. 1—A differential assembly set up in the shop lathe, ready for cutting off the rivet heads to remove the old ring-gear.

Before mounting a differential assembly in the lathe, clean the entire assembly thoroughly with gasoline or kerosene and make sure that no broken teeth, chips or other foreign substance remains in the housing. Also inspect the housing for defective nuts and bolts, replacing any defective parts immediately.

Wash the bearings in *clean* kerosene or gasoline. Inspect the bearings carefully and if they are cracked, worn, pitted or in any way defective, replace them with new ones.

The center holes in the ends of a gear case are chamfered to a 60° angle. Test them to be sure that they are true with the bearing seat. If the center holes are slightly marred, it may be possible to remove the burrs with a file or scraper so that the bearings will run true.

However, if the centers are badly mutilated, they should

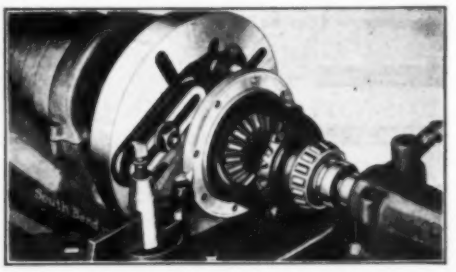


Fig. 3—Machining the differential flange case true, to receive the new ring-gear.

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"Joe, I congratulate you. I hope more of you men will become Gold Medal Drivers next year." ... NOW YOUR MEN HAVE AN ADDED INCENTIVE TO PLAY SAFE.

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AND ON THE ROAD ... *A large replica of the award on his truck tells the world he is a safe driver ... builds* GOOD WILL *for you.*

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OUT of the B. F. Goodrich Rubber Company's experience in developing the Silvertown Safety League which helped nearly a million motorists avoid accidents last year, Goodrich has established the Silvertown Safety Awards for the prevention of accidents among truck and bus drivers.

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Your nearest Goodrich Distributor is safety headquarters for this drive. Get in touch with him today. Do it for the sake of humanity ... Do it for the welfare of the motor transport industry ... Do it in the interest of your pocket book. *But do it now!*

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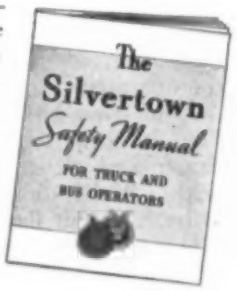
This especially prepared Silvertown Safety Manual for Truck and Bus Operators. 48 pages, graphically illustrated—Full of the latest information on safety practices that you can put to immediate use. Write today for your copy of this invaluable handbook. Address Dept. T 35. The B. F. Goodrich Rubber Co., Akron, O.



Goodrich *Safety* Silvertowns

for Trucks and Buses

A "HOW-TO-DO-IT" ARTICLE *(Continued)*

be machined true by centering one hub in the lathe chuck and supporting the other hub in a steady-rest. After making sure that the center holes are accurate, the assembly is ready for mounting in the lathe.

Most ring-gears are riveted to the flange. If they happen to be bolted, the bolts are easily removed with a wrench. *Care must be exercised not to damage the differential flange while doing this.* When the gear is riveted on, the safest and best method to follow is to mount the assembly in the lathe with the gear teeth *towards the headstock*, as in Fig. 1, and cut the heads off the rivets. Under no circumstances should the rivets be hammered out, as that procedure destroys the accuracy of the flange.

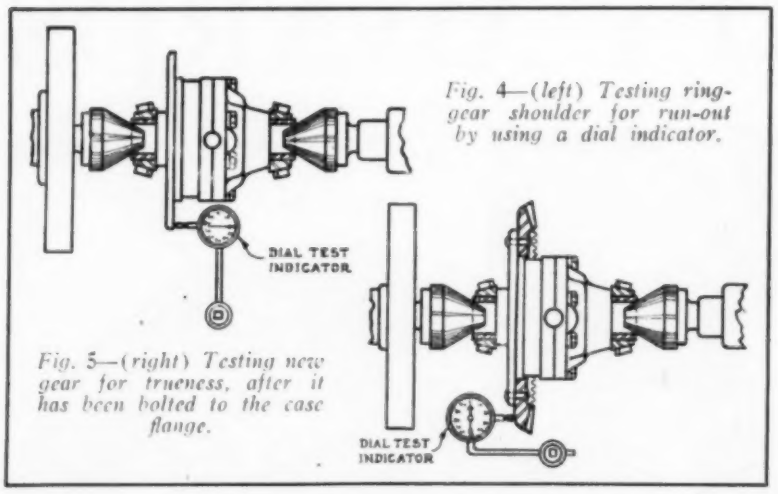


Fig. 4—(left) Testing ring-gear shoulder for run-out by using a dial indicator.

Fig. 5—(right) Testing new gear for trueness, after it has been bolted to the case flange.

Place a regular round nose cutter bit in the tool holder and, after starting the lathe in medium back-geared speed, feed the tool in carefully, taking a light cut across the heads of the rivets. Repeat, taking several cuts until the rivet heads have been machined off flush. Then remove the differential from the lathe and carefully tap out the rivets with a drift punch and hammer. Doing the job this way is the best method known.

After the old gear has been removed, reverse the position of the differential assembly in the lathe, mounting it so that the flange portion is facing the tailstock. Then place a right-hand corner tool in the tool post and arrange the lathe for facing the flange. Lock the carriage to the lathe bed and take a light cut, again using medium back-geared speed, feeding the tool from the center of the flange *outward* towards the operator.

Take two or three light cuts to machine the surface smooth, being careful to get the inside corner sharp and clean. Then test the face of the flange with a dial indicator, mounted in the tool post of the lathe. If the flange does not run true take one or more light facing cuts until the final test shows a run-out of not more than .002" which is considered sufficiently accurate. The differential case flange is now ready for the new ring-gear.

Clean the differential gear and the face of the flange thoroughly, and fit the gear to the case flange. Place a temporary bolt through every other hole and tighten evenly against the flange. By tightening opposite bolts a little at a time, the gear can be drawn perfectly flat against the case flange.

When the new gear is bolted to the flange, place the differential assembly in the lathe again, with the gear teeth facing the tailstock. Then, with your dial indicator, test the back of the gear by revolving the assembly slowly by hand. The back of the gear is ground concentric with the pitch circle of the gear teeth at the factory, so there should be no run-out.

However, if this test does show more than .003" run-out, unbolt the ring-gear from the flange and examine carefully for burrs, dirt or chips which might prevent the gear from seating accurately on the flange. A thorough cleaning will usually remedy the trouble. Upon rare occasions a distorted new gear may be found. In this case, have your jobber or truck dealer replace it with another.

When the gear is properly fitted to the flange and the test shows less than .003" run-out, remove the differential assembly from the lathe. Then rivet two holes opposite each other, and then the other holes in pairs, at quarter turns around the bolt circle. Remove the temporary bolts and rivet the remaining holes. If you have a large press, use a riveting fixture to do the job. If not, a heavy rivet set and hammer on a riveting anvil will do.

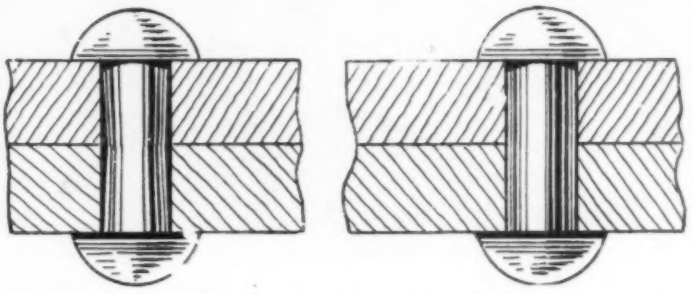


Fig. 6—The difference between hot and cold riveting. At left, contraction of hot rivet from the hole surfaces upon cooling. At right, a rivet headed over cold in a press fills the hole evenly, so that the heads of the rivets do not take most of the load.

Before reassembling the differential in the automobile, bus or truck, the pinion shaft should be tested between lathe centers for run-out. There should not be more than .001" run-out at any of the bearing surfaces. When making this test be sure that the center holes in the ends of the shaft are clean and undamaged.

If the pinion shaft does not test within .001", it should be straightened or replaced. All gear manufacturers now insist that the pinion and gear always be replaced together. This is the best practice as it insures against inaccuracies and assures mated gears.

The trend in automobile manufacturing now seems to be towards making the pinion shaft integral with the pinion, which will eventually become universal practice, no doubt.

Everything considered, replacing the ring-gear on a differential assembly is a good job for any shop to

(*Please turn to page* 46)

"At the end of the first year, your machine showed us an actual cash saving of $866.00 even though we had increased the price of our new oil 17%. Our oil expense per bus mile has decreased 47%."

Talk to any Skinner Reclaimer user. Ask him how it cuts oil costs and reduces maintenance expense. You will get the same money-saving report everywhere—"Skinner cuts oil bills 40 to 60 per cent—reclaimed oil is as good as new!"

In the operation of your own fleet, the daily waste of oil and hard earned cash can be prevented. Hundreds of today's successful fleet owners are doing it by renewing crankcase drainings with Skinner Reclaimers. Use the coupon and get complete facts that will show you exactly what a Skinner in your own garage can do for you. No obligation!

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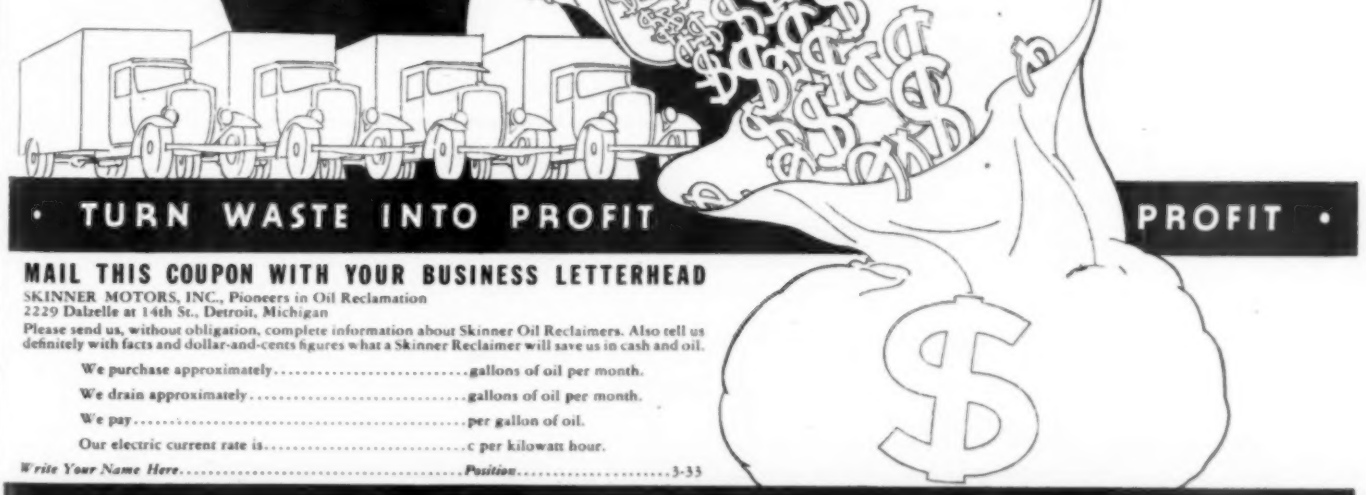
Manager of the Southwestern Bus Co., Elyria, Ohio, operating a fleet of 17 motor busses. This company also reports, "The reclaimed oil under analytical test showed a higher viscosity than did the new oil . . . and stood up for a greater mileage than did the new oil."



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We purchase approximately.....gallons of oil per month.
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We pay.....per gallon of oil.
Our electric current rate is.....c per kilowatt hour.
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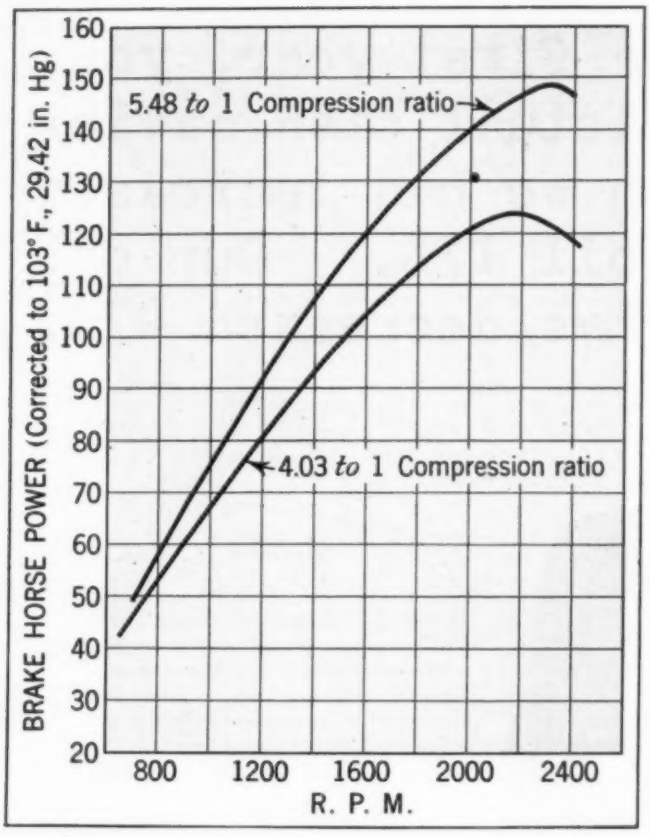
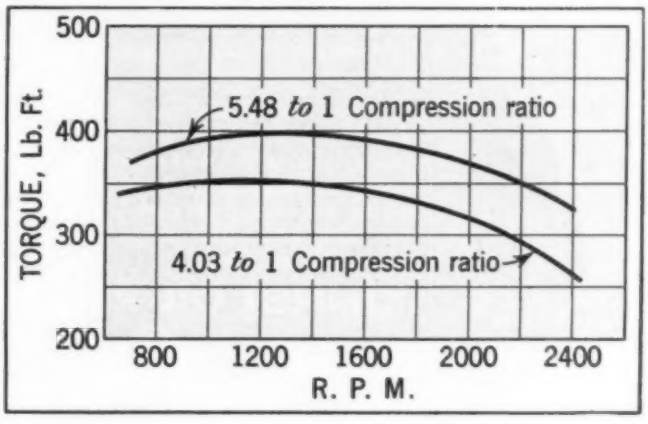


BRAKE HORSEPOWER: *With a compression ratio of 4.03 to 1, the engine develops a maximum brake horsepower of 124 at 2125 r.p.m. With the installation of pistons which give a compression ratio of 5.48 to 1, the engine develops 149 brake horsepower at 2300 r.p.m.—without any other changes in construction or adjustments with the exception of spark advance, which was set for maximum power in each case.*

HIGH

TORQUE: *By raising the compression ratio from 4.03 to 1 to 5.48 to 1, an increase in torque is effected . . . ranging from 8% at 700 r.p.m. to 24% at 2400 r.p.m. This increase in compression ratio was accomplished by installing alternate pistons furnished by the manufacturer.*



RESULTS OF ECONOMY TESTS ON THREE BUSES OF HIGH AND LOW COMPRESSION

FROM a large fleet operation, three average buses were selected. Accurate mileage and cost figures for over 10,000 miles of normal operation were compiled. The compression ratios were then raised from approximately 4.75 to 1 to approximately 5.5 to 1. They were then run—each in excess of 10,000 miles—on Ethyl Gasoline. Buses A and B were overhauled during the test, giving them periods of approximately 5000 miles before and 5000 miles after regular reconditioning. Bus C had been overhauled at 3000 miles before the test started and continued throughout without inspection. Mileage results follow:

Bus	Mi. per Gallon Test Average	Mi. per Gallon Previous Average	Increases	% Increase
A	5.52	4.46	1.06	23.8
B	5.68	4.41	1.27	26.5
C	5.35	4.25	1.10	25.8

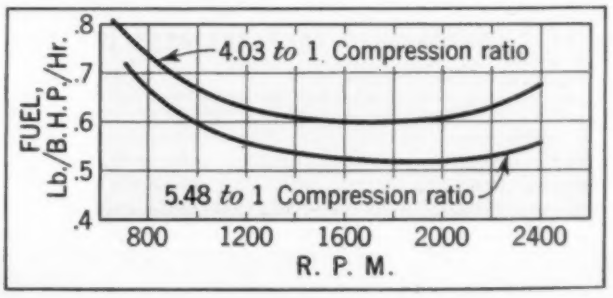
On mileage gains alone, each of the three buses justified the expenditure of the added cost per gallon of Ethyl Gasoline. IN ADDITION there resulted a saving of 32% average decrease in oil consumption, lessened engine wear-and-tear, etc. AND better performance, better time, larger pay load—all from a change that in itself showed a SAVING.

This specific proof is not unusual. The general improvement curves shown above for horsepower and torque were made on a typical engine that was showing fuel economy (as given in the chart below) at the same time.

In a nutshell:

High Compression *plus* Ethyl Gasoline gives more — costs less!

FUEL ECONOMY: *Shown in pounds of fuel used per brake-horsepower hour for the two compression ratios of the same engine represented in the torque and brake horsepower curves shown above.*



COMPRESSION *with* ETHYL GASOLINE

LOWERS operating costs IMPROVES performance

THE double-barreled gain from high compression is this: It will pay its own way in fuel economies that more than offset the added cost of Ethyl Gasoline... AND it will produce needed increases in horsepower and torque.

Note: *High compression does* NOT *increase bearing loads. It actually LOWERS peak bearing loads.*

Look at the performance curves on the opposite page. What would improvements like these mean in your fleet?

These are not exceptional increases; they are the normal results of increasing the compression ratio of a typical heavy-duty six-cylinder engine from 4.3 to 1 to 5.48 to 1. Fuel economy curves for the same test engine with the two compression ratios are shown at the bottom of the opposite page.

Will high compression be as profitable as this in YOUR fleet? One large fleet operator recently completed tests of his own. Three average engines were changed from high to low compression with replacement cylinder heads furnished by the engine manufacturer. Performance improvements were just as great as would be expected from the curves shown. His savings on increased mileage per gallon of fuel are shown in detail.

Increased taxes in many states threaten to cut into 1933 profits. Now more than ever is the time to take a long step in the direction of economy and service improvements. We will be pleased to send you—and any other members of your organization—further data on the advantages to expect from high compression in heavy duty engines. Write Ethyl Gasoline Corporation, Chrysler Building, New York City.

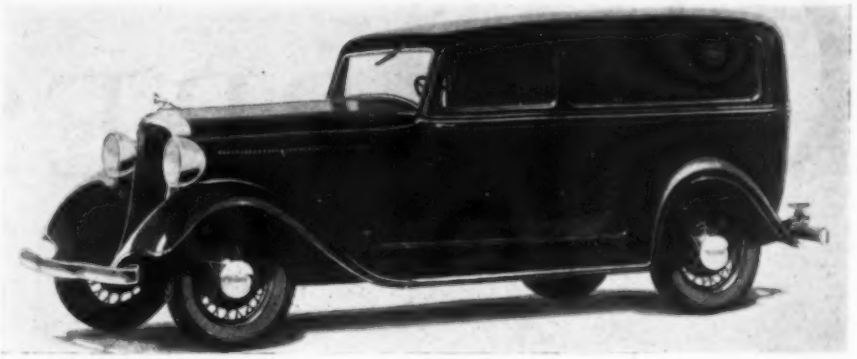
ETHYL
ETHYL GASOLINE CORPORATION
THE WORLD'S HIGHEST QUALITY MOTOR FUEL

Ethyl fluid contains lead. © E. G. C. 1933

THREE "COMMERCIALS" BY DODGE

AN outstanding feature of the Dodge Brothers exhibit at the recent automobile show is the series of three new 70 h.p. commercial cars. They are the first of their type to be equipped with floating power engine mountings and other advanced chassis details.

The Commercial Sedan, illustrated here, together with the Commercial Panel and the Commercial Express, comprise the line. The pleasing appearance of the Sedan is quite evident. The body is 53 inches long, 44¾ inches wide and 44¼ inches high. Access to the load compartment is achieved by the use of a large rear door, hung on the left side. This door is provided with a large, rectangular glass window and a key-lock. The entire body is rust-proofed before lacquering, by the "Parcoliting" process.



Floor of the Commercial Sedan is of heavy plywood. Body interiors are finished to match the trim. There are no wheelhousings—the full capacity of the body being available for merchandise carrying. Illumination is provided by a dome light controlled from two switches—one at the light, the other at the rear of the door.

As to mechanical features; Steering columns are adjustable; brake and gear shift levers are placed well forward, providing easy access to the driver's seat from either side; hydraulic brakes operate on four wheels; floating power engine mountings are used; other typical Dodge features are also incorporated.

Companion models of the Commercial Sedan are a Commercial Express, having streamlined cab and all-steel pick-up body, listing at $450; the Commercial Panel, having large-sized panel body with streamlined cab, listing at $540; the Commercial Sedan, illustrated, lists at $555. The prices are f. o. b.

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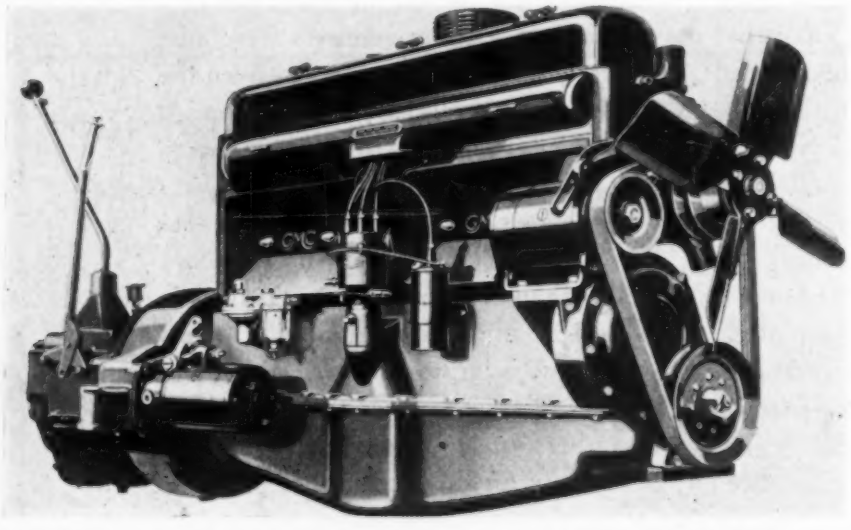
"221" G. M.'s NEW VALVE-IN-HEAD ENGINE



A NEW six-cylinder, valve-in-head engine, designed for use in high speed delivery models, is announced by the General Motors Truck Company, Pontiac, Mich.

The new engine is known as the "221" and is now available in G. M. C. models T-18, one and half to two tons capacity, and T-23, two to three tons capacity. With 3-3/16" bore and 4⅝" stroke, giving 221.4 cu. in. of piston displacement, this engine delivers 69 brake h.p. at 2800 r.p.m. and has a maximum torque delivery of .7 foot pounds per cubic inch of displacement, which amounts to 155 pounds at 1000-1800 r.p.m. Special light-weight semi-steel pistons are used. The cylinder head is of chrome nickel steel. The cylinder block is also of special semi-steel, with the upper crankcase ribbed.

The overhead valve construction makes for greater engine efficiency and increased power output, and presents an advantage from the service angle, in view of the ease with which the cylinder head can be removed. Down-draft carburetion is used. The unique center outlet exhaust manifold is located directly beneath the carburetor outlet and acts as a "hot-spot." The air-cleaner is oil-wetted. The carburetor and its related parts are located high up on the side of the engine, bringing greater ease to the making of adjustments than in the previous type.

A four-bearing crankshaft, statically and dynamically balanced and equipped with counterweights and harmonic balancer, is utilized, with easily removable steel-backed main bearings which can be removed from below by taking off the oil pan and without removing the crankshaft.

The generator and water-pump drive are of a special design, insuring trouble-free operation, the water pump shaft turning on tapered roller bearings. A four-blade 18-inch fan, crankcase ventilator and non-jamming starting motor are among the other improvements. The engine mounting has a three-point suspension and is set in rubber. The oil capacity is 7½ quarts; the water capacity 16 quarts. The "221" will replace the former "200" in the G. M. C. line.

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*15 to 1

is the preference among automotive manufacturers for Ross Steering!... More than 90 makers of trucks and buses use Ross.

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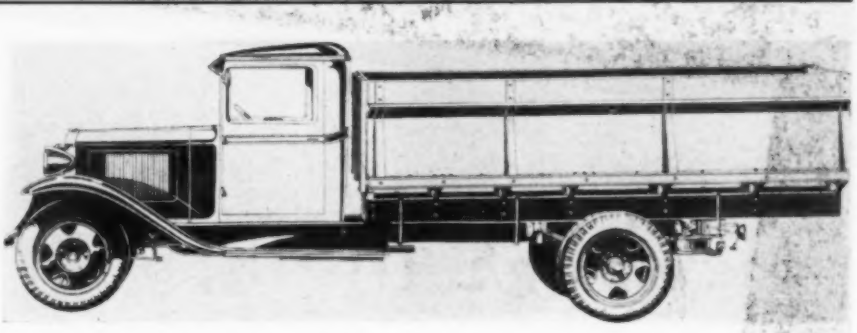
ROSS GEAR AND TOOL COMPANY • LAFAYETTE INDIANA

Say "I saw it in FLEET OWNER"—It Helps!

CHEVROLET'S 1933 NEW TRUCK MODELS



CHEVROLET'S 1933 commercial vehicles include three lines: the light delivery, with a wheelbase of 109 inches; a truck with a wheelbase of 131 inches; and a truck with a wheelbase of 157 inches. The light delivery line, rated as a one-half ton vehicle, is for light duty. Sheet metal parts and radiator have the same appearance as those in the truck lines.

For the 131-inch wheelbase truck line, either single or dual wheel equipment is available. Chassis features include a four-speed transmission; 10-inch clutch; heavy duty front and rear axles. This truck rates as a one and one-half ton vehicle, with an allowable gross weight of 7,500 pounds with single wheels, and 8,300 pounds when duals are used.

The 157-inch wheelbase truck has an allowable gross weight of 7,900 pounds with single wheels, and 8,300 pounds with duals. It has the same major units as the 131-inch wheelbase truck, except for the frame, which is longer and of heavier construction.

The Sedan Delivery is a light commercial car. Besides the other chassis features of the half-ton line, passenger car riding qualities are provided by shock absorbers and springs with the same specifications as those used on the sedan and the coach of the passenger line.

Engine in all three lines is identical and the half-tonner includes new helical syncro-mesh gears. It is more powerful this year and greater economy is claimed. Horsepower output is increased.

All three lines use larger front brakes, with wider linings and heavier operating parts. The larger rear brakes on the half-tonner are equipped with the "cut-in" system of brake linkage, permitting the operation of both front and rear brakes by either brake pedal or hand brake lever.

Both lines of trucks have larger diameter rear spring pins. I-beam section in the front axle is heavier. The rear axle has been redesigned. Increased torque capacity and greater spring pressure feature the new 10-inch clutch, and the new universal joint is of the 4-arm forged spider type. Throughout the lines, fuel tank capacity is larger—14 gallons in the half-tonner and 15 gallons in the trucks. Steering ratio has been raised from 12:1 to 14:1.

The following types of body have been added to the 157-inch wheelbase truck line: Farm, Farm Unit, with racks and Tip Top sides; Stock Rack; and School Bus. With the Tip Top grain sides, the Farm Unit body has a body load capacity of 136 bushels.

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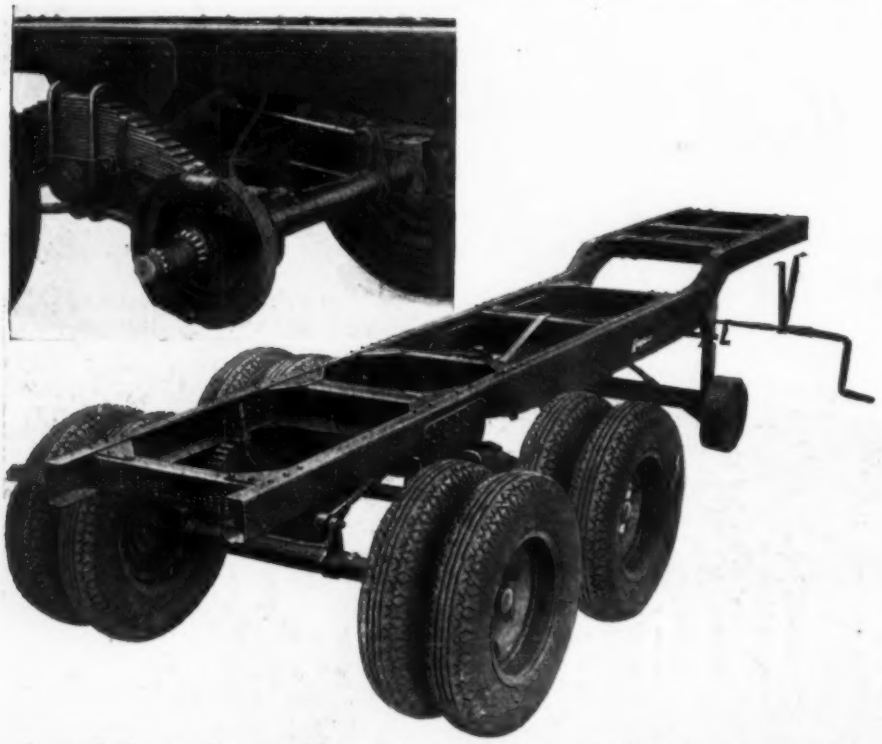
NEW UNIVERSAL SEMI *or* FULL TRAILER

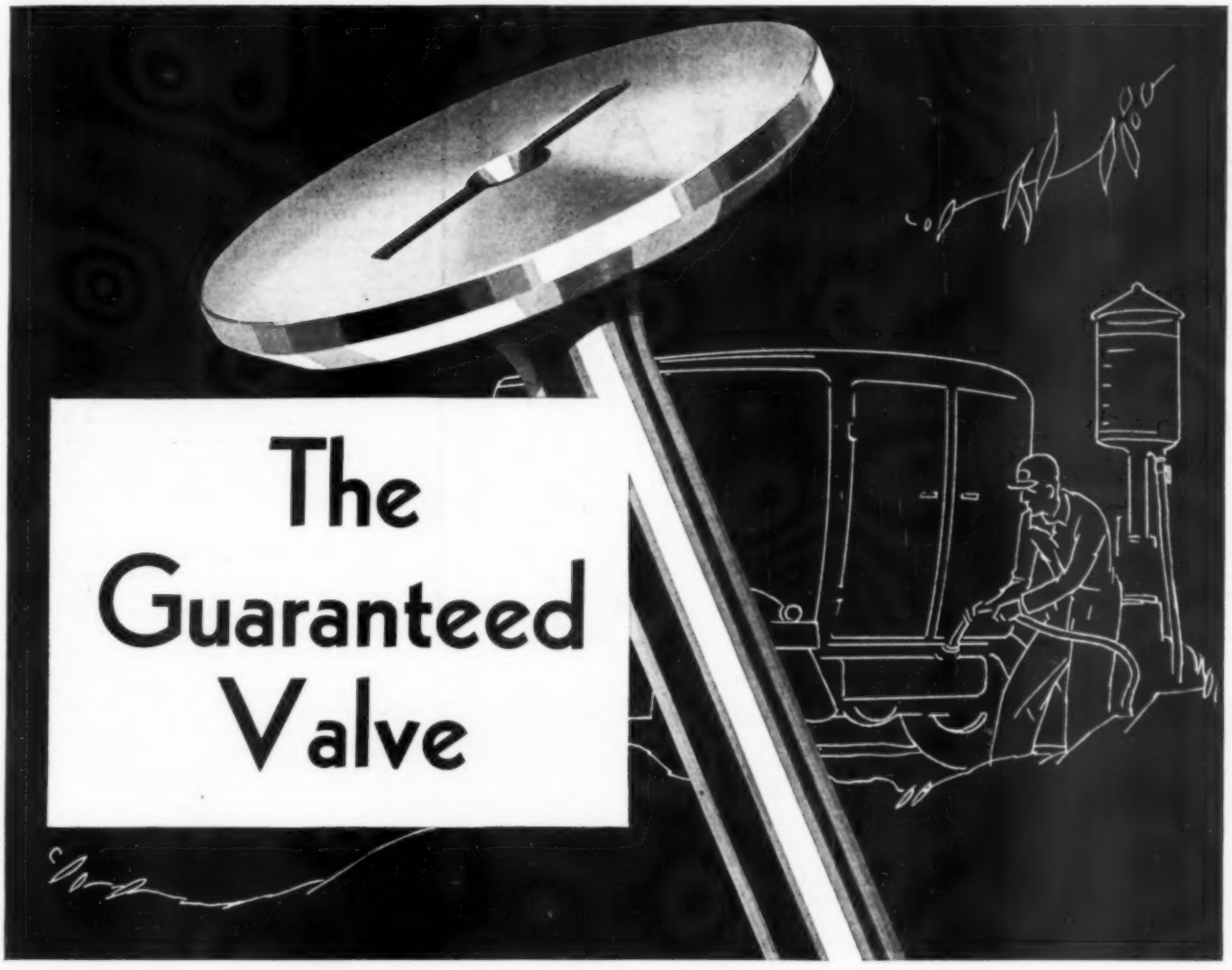


A NEW tandem axle semi-trailer is announced by Kingham Trailer Company, Louisville, Ky. It is claimed to be of especial interest to operators in those sections of the country where the axle load is restricted by legislation.

The new job is known as the "Universal" model, since it can be converted into a six-wheel, full-trailer by the addition of a standard axle unit to the front-end. A "quick-detachable" unit can be furnished for this purpose.

The rear axle unit proper is of Timken design, using flat-end springs on tubular axles, with rubber-mounted radius rods held in place by ball-and-socket joints. This feature is claimed to hold the axle in alignment and still permit flexibility.

The frame and front-end of the semi-trailer are similar to other models of this manufacturer, furnished in the standard 6-inch drop frame, or with a frame having a 14-inch drop. Hydraulic brakes with BK booster are furnished as standard equipment; Westinghouse air brakes are optional. This unit is offered in three different sizes and furnished either with or without bodies.



TOLEDO VALVES PROVE THEY CAN "TAKE IT"

● In all kinds of trucks, coaches and buses, under the severest month-in and month-out service, with all grades of gas, Toledo Super-Forged Valves delivered *guaranteed* satisfaction in hundreds of fleets last year. You want the one valve that you can be dead sure will stand up in fleet service. You're safe with Toledo Super-Forged and Guaranteed Valves.

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TOLEDO

Say "I saw it in FLEET OWNER"—It Helps!

87. **No More Dirty Hands.** If you are a "white collar" man, occasionally poking into rear ends and transmissions; or if you are an honest-to-goodness "grease-bather" who fusses with grease'n oil, we know that you will want a free sample of this product. It's a white cream, to be rubbed into the hands before starting to work. Besides protecting the skin against gasoline, battery acid, paint, lacquer and grease, the makers tell us that all you have to do is let water run on your hands and, presto! these objectionable materials will wash off and leave "a skin you love to touch." A free sample of this new hand-cream is yours for the asking. Just fill in the coupon below with No. 87.

•

88. **Battery Engineering Service.** Literature that describes a new service which, as its object, helps fleet operators to keep their maintenance costs as low as possible. It is conducted, we are told, by carefully trained and experienced battery engineers and is made available without charge. That's about all we know about it so far, but we shall be glad to have the details sent without obligation. Number 88, please.

•

89. **A High Score Without Scoring.** The high score referred to is one of 80,000 miles, average, per set of brake blocks, without scoring a brake drum. At least, that's what we are told leading bus and truck operators are getting with this particular make of lining. If the "proof of the pudding is in the eating" why not accept catalog sheets, prices and details of their free test offer? Number 89 makes it easy for you to get this information without cost.

•

90. **Tough-Film for Tough Work.** What savings are other operators making by using good lubricating oil? What operators are in my line of business? What is the meaning of tough-film? These, and other questions will be answered, accompanied by definite proof, if you include No. 90 in your list. At any rate, it is believed that experience is the best teacher and the oil experience of other operators in your line of business should prove of more than passing interest.

WHAT DO YOU READ?

HERE'S a hand-picked assortment of literature that is offered to you entirely without obligation.

We've even made it easy for you to get it. Fill in the coupon below, mail to the Editor, and let us do the work. We'll ask them to send it at once and not to bother you with salesmen, either.

91. **More Jack with Good Jacks.** For doing all kinds of lifting, up and down, also for engine installation, frame straightening, and all kinds of light press work, you will find hydraulic jacks "right down your alley." And don't tell us that you have no hydraulic jacks in your equipment; most everyone has them. We believe it will pay you to read over this literature on hand, floor and garage jacks that make light work of heavy loads. Ask for No. 91 and remember, there's no obligation.

•

92. **Hard Steering Made Easy.** If your drivers are suffering from "Driver's Back" maybe some of this is caused by difficulty in steering heavy vehicles. Here's a manufacturer offering replacement steering gears at moderate cost, that are claimed to give easier steering, longer wear and quicker adjustment. And they're preferred by 206 engineering staffs—the big boys in the car, truck and bus factories. An interesting list of cars, buses and trucks that these gears will fit is free for the asking. Just mention No. 92.

•

93. **Lights That Don't Fail.** A new line of lamp bulbs for truck and bus fleets that are said to stand up under repeated road shocks and constant vibration. Their balanced focuses (or should we say foci?) light the road ahead with correct illumination. Number 93 brings, free, a specification chart and price schedule.

•

94. **So Long, Baldy!** Bald-headed tires are a menace to safe driving. This has been proven by real authorities in the field. They also keep maintenance costs high, due to skids, blowouts, collisions and wrecks. Here's a man with a simple, inexpensive, hand-operated tool that regrooves pneumatic tires without removing them from the vehicle. The details and price? Number 94, please.

•

95. **Reboring Made Easy.** Many operators are interested in better methods of cylinder reconditioning. Here's a manufacturer who claims that his heavy-duty boring bar will permit closer fits, make motors run cooler, use less oil and show better operating results. It's not necessary to remove the block from the chassis, of course, which is a big saving in itself. Let this literature give you the further details, prices, etc., without obligation of course, by including No. 95 on the coupon below.

•

96. **Grease Fitting Sample Free.** A new line of grease fittings at "depression" prices, according to the maker. These are made in all standard types and have new, patented, construction features. No pins to fall out, lower prices and bigger discounts are but a few of the inducements, it is pointed out. Number 96 brings a free sample.

•

97. **"How-to Do-It" Booklets.** Yes sir! Four of them are hot off the press. They are: How to Grind Valves; How to Service Armatures; How to Finish Pistons; How to Make Bushings. The methods are recommended by car manufacturers, it is claimed. Number 97 brings all four booklets, free, of course.

•

98. **Listening to the Radio?** If you have been lately, you no doubt have heard the splendid "Sealed Power" presentation. The Sealed Power advantages are offered to fleet owners as well as car owners. Among the literature offerred is an interesting "Shop Chart" showing correct piston clearances, ring data, bearing tolerances, etc. How to install cylinder sleeves is another feature. No. 98 brings all the Sealed Power information without obligation.

•

99. **Solves Your Brake Problems.** Here, for your use, is a 124-page manual containing what is said to be the most helpful information ever put between the covers of a book. It contains illustrated instructions covering every type of brake made, including vacuum and air brakes. Also facts on relining, adjusting, trouble-shooting. And it's absolutely free. Simply mention No. 99 on your coupon at the left.

The Editor, ...1933
FLEET OWNER,
90 West St., New York, N. Y.

Kindly send me without obligation, the following free books mentioned in the.....issue. (Literature will not be sent unless firm name is given.) Order by number.

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These attractive Dugan bodies were built by Hopkins Manufacturing Company of Hanover, Pennsylvania.

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Say "I saw it in FLEET OWNER"—It Helps!

TROUBLE SHOOTER

(You Ask 'Em — We Answer 'Em)

A department, devoted to correspondence from readers of FLEET OWNER. Any questions having to do with automotive service will be answered in this department. All properly signed inquiries will be replied to by mail and such of them as are believed to be of possible interest to other readers will be published in these columns.

This Engine "Makes" Oil

Question: A 1931 Oakland Sedan owned by one of our employees came into our shop with the complaint that it was necessary to draw off about one quart of oil from the crankcase every 100 miles in order to keep the oil at its proper level.

Our mechanic drained some of this oil and found no evidence of water but was pretty well satisfied that it was gasoline that caused the increase. This model car uses a fuel pump and we suspected it might be the cause of the trouble, but on inspection found it to be in perfect order and apparently there was no way gasoline could get from it into the crankcase. This car has been run in the neighborhood of 30,000 miles and the compression and rings are all right. Can you give us any ideas as to how the gasoline is getting into the oil? —J. A. S., K. R. O. C., Ltd., Bakersfield, Calif.

Answer: We presume that this is a V-Eight Oakland and feel quite certain that this gasoline comes from a leaky carburetor—either the bowl, the overflow vent or the accelerating pump on the carburetor. The gasoline that overflows will leak out and drop on the valve cover and subsequently find its way into the crankcase. It is also possible, but not probable, that the choke is sticking, causing the carburetor to flood.

Our suggestion is that you take the carburetor off and have it thoroughly gone over, by an authorized carburetor service station if possible. A new valve cover gasket might be necessary and you should also make sure that the intake manifold is tight.

It is also possible that one or more of your cylinders are not firing and the unburned gasoline drains into the crankcase, although the missing should be noticeable while the car is in operation. We believe the gasoline comes from the carburetor, however.

You May Not Believe It!

(But It's True)

THE FACT:

IN any gasoline engine, piston travel is greater in the upper half of the stroke, than in the lower half. The speed of the piston is never the same at any point.

EXPLANATION:

IF you don't believe this one, lift the head off any motor. Should it have a bore and stroke of 3½x5, you will find the piston travel is 32 per cent greater in the upper half of the stroke. The percentage will vary with engines of different dimensions, but the upper half of the piston stroke will always be greater than the lower half.

Without going into geometrical calculations, the reason is that the connecting-rod cants over to one side once on the up-stroke and once on the down-stroke, thus decreasing its vertical height when it is in the canted position.

Since piston travel depends partly on the vertical height of the connecting rod, it will be seen that part of the travel is lost on the first half of the up-stroke, and is gained on the top half of the up-stroke, as the rod straightens out.

On the down-stroke the reverse is true, but since the rod pushes up and pulls down, more piston travel occurs in the top half of the stroke, both going up and coming down. This, of course, affects piston speed, and as a matter of fact, the piston stops when it gets to the top and then starts out in the other direction.

The Heater Does Not Heat

Question: We have installed a hot-water heater on one of our salesmen's cars, a 1929 Plymouth, but seem to have no results worthy of mention. Please advise whether or not a heater of this type can be used on this car and if so, what the proper hook-up should be.—G. E. M., St. Paul, Minn.

Answer: Make sure that the top of the heater is at least 3 inches below the water level in the radiator. On this type of cooling system the heater should be vented more frequently than on cars with circulating pumps.

The heater should be installed so that the hose lines are as short as possible, also as direct as possible, and without humps in the hose, to assist the natural flow of hot water upward from the cylinder head (heat indicator fitting) to the top of the heater. The water will then filter down through the heater, traveling out from the bottom of the heater to the lower hose connection at the radiator.

It is important that the top of the car heater should be at least three inches below the top of the water level in the radiator. In no case should a loop or hump in the hose extend above the top of the heater, as air pockets would form in this loop and retard the circulation.

In installing hot water heaters on cars *with* water pumps, opinions seem to differ as to whether the hot water should enter the heater from the top, or from the bottom. Both methods are used, as the pump has sufficient force to cause the hot water to travel upward in the heater. In a system *without* a pump, however, the hot water *must* enter the heater at the top.

Some Say Screwed—Some Say Keyed

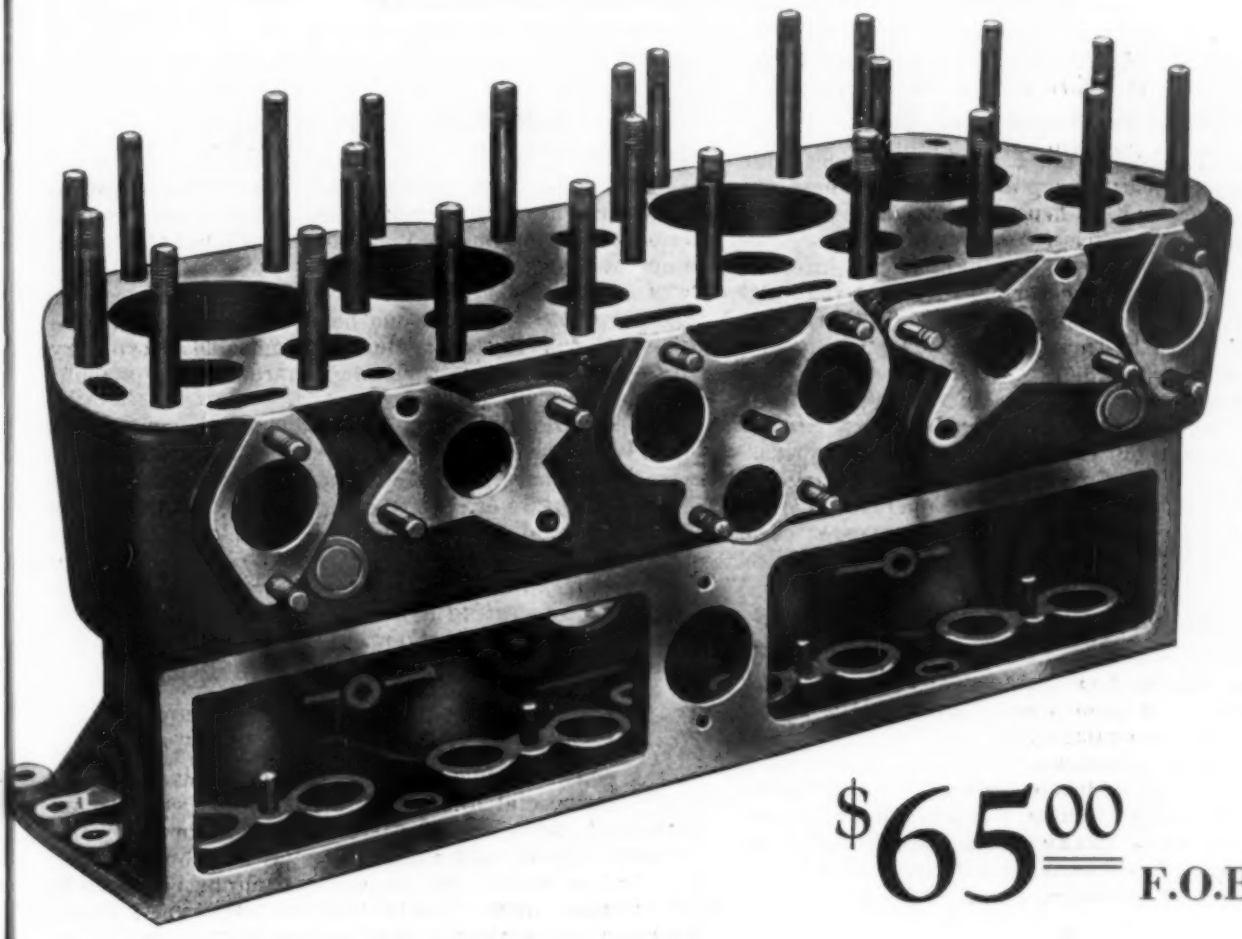
Question: Will you please explain the method of removing the vibration damper on a 1928 Oakland, Model AS. Some of our fleet mechanics say it is screwed on; others say it is keyed on. We are not very familiar with passenger cars, as trucks is our line, and would appreciate your advice.—J. H. C., Meriden, Conn.

Answer: The factory service department says it is *keyed* on, and this is also the information in our files. It can be removed with a wheel-puller or similar device.

GRB CYLINDER BLOCKS

for

WHITE TRUCKS AND COACHES



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QUESTION *of the* MONTH

"By far, one of the most valuable departments to be found in any automotive publication. Every fleet man should be delighted to cooperate."—A Reader

Here are Some of the Most Interesting Replies to Question No. 28:

Plywood Advantageous on Buses

"COMPOSITE bodies are used on our buses; our trucks use assorted types of bodies. These are 100 per cent 'standard' bodies, designed and built by the vehicle manufacturers.

"Plywood paneling is used throughout the interior, and metal paneling on the exterior. We find that plywood paneling (both metal-faced and plain) has strength with lightness in weight, is non-warping and easy to refinish.

"We do our own body repairs and repainting in our own shop, on the entire fleet. We are still experimenting with reference to our choice of paints and lacquers."—*K. L. Conner, Supt., Equipt., Jamestown Motor Bus Transportation Co., Jamestown, N. Y., operating a fleet of 22 buses, 6 trucks, 1 trailer and 3 passenger cars.*

●

Express Bodies in Packing Fleet

"WE use express bodies on our truck fleet; all of them are 'custom' built. These are designed by us and built by an outside body builder. We prefer bodies of all-steel construction.

"Repairs to all-steel bodies are done in our own shop, particularly the all-steel welded bodies. We also do our own repainting, using enamels. Have had no experience with plywood."—*Cudahy Packing Company, J. M. Heiman, Foreman, Los Angeles, Calif., operating a fleet of 91 trucks and 18 passenger cars.*

●

You Have a Dollar—

—and I have a dollar. We swap. The result? Each of us still has a dollar. No gain—no loss.

But wait a minute. You have an idea—and I have an idea. We swap. The result? Each of us now has two ideas! Catch on?

That is the very basis on which this Question-of-the-Month Department revolves. In order to make it as comprehensive as possible, it is necessary that we have a representative number of replies. Otherwise the tabulation that we send you, in exchange for your efforts in filling out the blank on the opposite page, will not be very conclusive.

We will forgive you for not doing it last month. After all, it was a short month and there were two Holidays besides. Ed. LaSchum says that a good fleet manager should read his trade journals. We know that you read yours, but for Pete's sake, give us a chance to serve you better by cooperating. The blank is on the opposite page. It's now your move!

H. Clay Fischer, Editor

Builds Own "Custom Bodies"

"TRUCK bodies used in our fleet consist of stake bodies and special line construction bodies. Sixty per cent of our truck bodies are standard, and 40 per cent 'custom' built. We design and build the latter, in our own shops.

"Most of our bodies that have paneling use steel for this purpose. We have one body using plywood. We believe that plywood is much stronger than ordinary wood paneling and with it we can reduce the amount of frames or ribs.

"We also do all of our own body repairs and painting. We are using lacquer on some jobs and enamel-varnish on others. Since our bodies are specialized ones for line work, we are better equipped to build them than the commercial shops, mainly because they are constructed of sheet metal."—*H. R. Grigsby, Supt. of Transportation, Oklahoma Gas & Electric Co., Oklahoma City, Okla., operating a fleet of 83 trucks, 53 trailers, 305 pass. cars and 5 others.*

●

Prefers Plywood to Wood for Panels

"A VARIETY of truck bodies may be found in our fleet, including stake, open express, pick-up, panel and special line bodies. About 40 per cent are 'standard' bodies and 60 per cent 'custom' built.

"The 'custom' bodies are built by a local builder, who also designs them. We do our own minor body repair work; major work is farmed out to body repair shops. On these jobs we insist that the repair material be the same as the original.

"While none of our bodies use plywood paneling, we would prefer plywood to wood paneling. The metal-faced plywood is lighter for the same strength, more durable, free from warpage and easier to paint. We do our own re-paint work in our own shop."—*G. A. Hogg, Supt, of Trans., Scranton Electric Co., Scranton, Pa., operating a fleet of 29 trucks and 50 passenger cars.*

●

Taxicab Fleet Repairs Own Bodies

"STANDARD Yellow Cab bodies are used on our taxicab fleet, of course, but our trucks have bodies of our own build. Repairs on bodies of all types are done by us in our own shops.

"We have had no experience with plywood paneling. We do some of our own painting and farm-out some of it. Enamels and lacquer are used. We specify the material to be used on paint jobs, when these jobs are farmed out."—*Hugh C. Larimer, Gen. Mgr., Yellow Cab & Baggage Co., Topeka, Kans., operating a fleet of 13 trucks, 19 taxicabs and 1 passenger car.*

A FEW *of the* BODY SERVICE REPORTS (*Continued*)

Custom Built Bodies in Bus Fleet

"STREET-CAR and parlor-car type bus bodies are used in our fleet. These are 100 per cent 'custom' built, made for us by a national body builder, according to our specifications.

"In building bodies, not enough thought is given to the fact that these bodies must be maintained in the field of operation. Some sort of ventilation should be provided between the panels to prevent deterioration. Too much labor is often necessary to get at certain sections for repairs.

"We do our own body repairs and our own re-painting, in our own shop. A standard make of lacquer is used for refinishing."—*J. W. Dillree, Shop Foreman, Lewiston Transportation Co., Lewiston, Pa., operating a fleet of 18 buses and 1 truck.*

●

Aluminum Paint Does Double Duty

"FLAT rack and insulated delivery bodies are used in our fleet, designed by the writer and built by us in our own shops. Six of them are using plywood paneling. We find that this material has many advantages, but the type we have used absorbs moisture and the plies tend to separate.

"All of our body repair work and painting is done by us in our own shop. We are using a special aluminum paint for two reasons: Trimmed with blue it presents a very neat appearance and is very appropriate for an ice-truck. It also has a wonderful insulating qualities."—*W. H. Rhodes, Garage Supt., Imperial Ice & Development Co., El Centro, Calif., operating a fleet of 50 trucks, 5 trailers and 5 passenger cars.*

●

Furniture Vans Are Built by Fleet

"FURNITURE vans are the type of vehicles we use and the bodies are designed by us and built in our own shop. Four of them use plywood paneling and 18 use metal paneling.

"We have found metal-covered plywood to be more satisfactory than metal on sheeting; also more satisfactory as far as finishing is concerned. We also do our own body repairs on the entire fleet, as well as all of the re-paint work. We use oil paint and varnish."—*A. V. Nidy, Garage Supt., People's Outfitting Co., Detroit, Mich., operating a fleet of 22 trucks, 6 trailers, 11 passenger cars and 7 others.*

●

New York Operators Discuss Maintenance

AT a recent meeting of thirty-two New York commercial vehicle operators, there was an interesting discussion of motor vehicle maintenance problems.

Most of the companies represented make definite periodical inspections. One company makes a safety inspection each time a car reports for refueling.

(Please tear out and mail to The Editor, The Fleet Owner, 90 West St., New York City)

Question No. 30—Anti-Freeze

What type of anti-freeze have you used this past Winter?.....

Please state the make, if permissible.....

What advantages or disadvantages have you experienced with it?.....

.....

.....

What were the reasons for your choosing it?.....

What was your source of supply? ☐ Manufacturer; ☐ Jobber; ☐ Dealer.

What is your normal consumption of anti-freeze per season? .....

How often do you flush the cooling system?.....

What method do you use?.....

Do you find that periodic cooling system cleaning helps the general performance of the vehicle and minimizes road delays?.....

Do you use radiator shutters?..... What other protective coverings?.....

Are your vehicles stored in a heated garage?.....Unheated? .....

Remarks that you think would interest other operators:.....

.....

.....

.....

How many vehicles in your fleet?

.....Trucks; .....Busses; .....Trailers; .....Pass. Cars; .....Others.

Note: If you cooperate with us and fill out this questionnaire, you will be entitled to a tabulated report covering all of the answers.

Swap your Maintenance experience with other fleet operators in this easy, convenient way. We do the work. You get the benefit.

Name of Firm .....

Address .....

City and State .....

Your name .....*Position*.....

KWICK-KUT
TIRE GROOVER

The Groover with the Top Guide Handle. Sells for: TRUCK SIZES—$17.50 and $30; Others $4.50 to $12.00.

SHELL PETROLEUM

—now using FOURTEEN Kwick-Kut MASTER Model tire groovers in their garages throughout the country.

It will cut your tire operating costs, too. Write for fleet users list and catalog.

KWICK-KUT MFG. CO., INC., 3821 Arsenal Street, St. Louis, Mo.

B-W Co.

Maintenance Men Swear by Bates Wohlert Parts

Try them yourself. YOU will say they're the best.

Starter Gears for all cars and trucks; Cylinder Heads; Manifolds; Clutch, Flywheel, and Transmission Housings; and small parts for popular cars and trucks. Complete line of Automotive Specialties. Send for catalogs today.

LANSING Bates-Wohlert Co MICH

A Hospitable Greeting

MELBOURNE HOTEL

Theres an eager wish to serve in the very way the doorman takes your bags at the curb; there's a warm welcome when you register; when you are shown your room; when you call for service..... Warmth-Hospitality-Comfort Economy! These are the things that make the Melbourne Hotel the unquestioned choice of every experienced traveller. You will do well to follow their example while in St. Louis.

EXCELLENT DINING ROOM AND COFFEE SHOP

O. P. GREATHOUSE
Manager

400 ROOMS
EACH WITH BATH
$ 2.50 from

LINDELL BLVD. AT GRAND AVE.
ST. LOUIS

To Eliminate Road Delays

(*Continued from page 18*)

intervals which he can determine from his own experience, an overhaul will become unnecessary, and he will confine himself to a point of periodic overhaul and go so far as to find this class of work unnecessary. Analysis of the mechanical history of the vehicles by makes, to show where the man-hours are spent for maintenance, will be a very good guide in keeping a fleet of trucks in repair.

The following three points should always be given some consideration:

1. To find out as far as possible the cause of each mishap or trouble.
2. To endeavor if possible to find a solution for it so as to prevent a recurrence of the trouble.
3. Determine whether the responsibility for the trouble is with the driver, the maintenance or inspection method or the manufacturer.

As the operation of motor vehicles becomes more and more a science, fleet operators are realizing that their big problem is to keep the equipment operating. They also realize that vehicles out of service for repairs are a tremendous cost in their operation.

Many operators who have adopted a policy of preventive maintenance report a considerable saving by adhering strictly to this system; and that it has reduced the man-hours materially. This preventive inspection system amounts to 2½ hours per vehicle per week (average).

Since it is an expensive item when a piece of equipment is in the shop, as its revenue stops, efforts are being made by fleet operators to obtain tools and equipment that will turn out repair work in the shortest possible time by equipping their shops with up-to-date servicing methods.

The following program can be adapted to almost any type of fleet operation. While no single plan or procedure is perfect, this recommendation will be found practically "ideal" from a general standpoint:

1. Reduce cost of operation by the selection of the right type of equipment for the work.
2. Methods of reducing maintenance:
   (a) Shop practice.
   (b) Education of mechanics.
3. Discussion of mechanical failures:
   (a) Recommendation made to reduce these failures.
   (b) Advising the service man of the dealer of these failures.
   (c) Joint report of these failures with comments and recommendations for their correction.
4. Closer contact between fleet operators, service managers and sales managers, to build friendship that is invaluable to all parties concerned. Confidence is thus created and the result is a better understanding of the other fellow's problem.
5. Research work on problems, the results of which when completed, are sent to all parties.

As stated before, road delays and failures are expensive and annoying to any fleet operator but they will happen occasionally in spite of anything anyone can do. The operator who plans his maintenance and works to his plan, can without question reduce failures to a minimum.

Another important item, is that of the number of vehicles maintained per man. Some thought has been given as to how many mechanics are necessary to maintain a given number of units to guarantee continuity of service and to minimize road failures. The average

is one repairman to each group of 12 vehicles. The personnel of course, is governed by the number of vehicles in the fleet and the amount of work that it is proposed to do.

It is surprising how this figure varies under apparently the same circumstances but naturally it is an individual problem with each fleet operator. The requirements of each and every fleet operator are found to differ in many details, such as the amount of work that is maintained in his own shop and the work that is farmed out to commercial shops.

I feel that the subject of Preventive Maintenance, in line with elimination of road delays, is one that still requires a considerable amount of study and research work.

●

Notes on High-Tension Cable

(*Continued from page 24*)

to offset the lateness. An uneven or jerky operating motor at low speeds can quite often be made to run smoother by replacing the high tension cable.

Often times a driver will find his vehicle sluggish and will bring in the car and be advised that his timing is late. The service man advances the timing and the car is a little better. Soon he comes in with the same complaint and the same remedy obtains. If a rewiring job (which really was needed) had been done, the trouble would not have further appeared.

Loss of power at high speeds is another indication of poor wiring. Quite often a motor will cut out and miss on hard pulls, indicating leaky wires or intermittent shorts. Back-firing might indicate leaky wires from one wire to another, causing cross-ignition.

In many cases it is rather difficult to detect defective high tension cables, as visual inspection will only show the extreme deterioration. Sometimes the cables are enclosed in tubing and cannot be seen, in which case it is quite impossible to detect leakage. Actual short-circuiting, however, will be indicated by missing cylinders, but an occasional missed explosion, especially at high speeds, cannot be traced to faulty ignition cable by inspection alone, but only by careful checking.

Many do not realize the importance of having high grade wiring in every car that leaves their shops. Wiring which is a year or two old should be replaced with new, especially if it looks bad. Even if it looks to be in good shape, there can still be many losses through defective insulation, which cannot be readily detected. It is best to renew, wherever the slightest doubt exists.

Some time ago a series of tests were conducted at one of our leading universities, which actually "shot full of holes" the old theory that high tension cable gives satisfactory service until it has deteriorated to the point where it actually refuses to function.

Cars were taken from actual service in cases where the owners had no idea that their cars were not properly functioning; they were taken in and given a complete laboratory test for horsepower at different speed ranges, gasoline consumption and general operating characteristics. The cars were then rewired with new high-tension cable and put through identical tests.

A comparison of the two tests showed an increase of gasoline mileage as well as increased power at high speed ranging all the way from ten to fifty per cent with the rewired cars. A vast improvement was also observed in their road service, particularly hill-climbing ability, after rewiring. The tests proved conclusively that the high tension cable system of the automobile should be replaced every few years, or oftener, depending upon the specific condition of the cable and the manner of its installation.

Truck Costs MUST Be Reduced in 1933

Here's an Easy Way to Do It!

1933 is not a year to fool with . . . your truck costs should be lowered by at least $500 per truck!

Now, here's a proposition. Install *Servis Recorders* on *several of your trucks.* The *Servis Recorder* gives you in a chart, a complete record of just what your truck did for the past 24 hours—the heavy lines recording running time and the blank spaces in between showing standing time.

That will show up all their delays and idle time. Then eliminate this costly waste of time (averaging $500 per truck).

Keep a record of these *Servis Recorder*-equipped trucks in our Time Record Book (furnished free) and compare their record with the rest of your trucks.

Then you will know what to do about the unequipped trucks, all right. Thousands of truck owners have made this test. That's why over 80,000 trucks are now *Servis Recorder* equipped.

This chart shows up all the delays. Here's a stop of 2 hours!

THE SERVIS RECORDER
"Keeps Trucks Busy"

SPECIAL PLAN

We have worked out an inexpensive "plan for these cost-cutting times" that you'll like. You can *find out* what this little Recorder can do for *your business* with very little outlay. Then you can decide whether to go ahead or not. Send for the Plan today. Just pin coupon below to your letterhead.

THE SERVICE RECORDER CO.
CLEVELAND, OHIO

THE SERVICE RECORDER CO. F.O.-6
Hanna Bldg., Cleveland, Ohio
Send us that *Special Plan*—without obligation, of course.

Company .....
Attention of .....
Street .....
City & State .....

ARMORPLY
A SUPERIOR METAL FACED PLYWOOD PANEL FOR BODY CONSTRUCTION
Write for samples and prices
UNITED STATES PLYWOOD CO. INC.
603 W. 36th. ST. NEW YORK CITY

KRAMER Certified cooling RADIATORS
for TRUCKS BUSSES and TRACTORS
OVALTUBE TUBULAR and TURBO CELLULAR CORES
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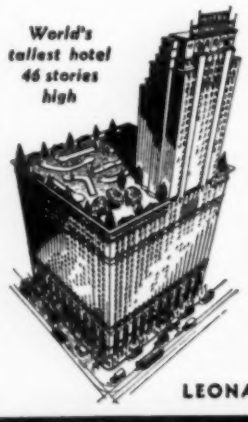
A CENTURY OF PROGRESS and the MORRISON HOTEL
1933 A CENTURY OF PROGRESS CHICAGO

World's tallest hotel 46 stories high
Stay at the Morrison when you visit the Chicago World's Fair of 1933. The Morrison Hotel is an outstanding example of the progress of invention and industry displayed in A Century of Progress. Perfectly located in the "heart of the Loop," everything worth while is nearby —theaters, shops, railroad stations. All rooms are outside with bath, Servidor, bed-head reading lamp and circulating ice-water. Reasonable rates — Garage facilities — Special floor reserved for ladies.
A great hotel in a great city!
2500 ROOMS — $2.50 UP
LEONARD HICKS, *Managing Director*
MORRISON HOTEL
Madison and Clark Streets, CHICAGO

Tire Regrooving—A Safety Measure

(*Continued from page 26*)

cannot entirely subscribe to this thought, since it is in many cases desirable to follow the original tread design of the tire, and re-groove it a bit deeper.

Someone claims that a proper re-grooving job will add about 20 per cent to the life of the tire, due to the fact that continued side-slipping on crowned roads will be prevented. However, it does enable the operator to determine definitely the amount of rubber still on the tread, besides enhancing the appearance of the tire either on the wheel or when used as a spare.

We understand, also, that it is considered against the law, in England, to drive a bald-headed-tired vehicle, so dangerous is it thought to be. Another point is called to our attention: In a collision of two cars in a Connecticut town recently, the man whose tires had been grooved stressed this point against the smooth, bald-headed tires of the other, and this is believed to have had a decided effect on the decision, as he won the case.

That's about all on this subject. If you have smooth tires, regroove them for safety's sake, or replace them with new ones. There are various regroovers on the market and the Editor will be glad to have illustrated circulars sent to you on request, without obligation. Just drop us a line and the catalogs (not salesmen) will come, whether you're located in Texarkana (U.S.A.) or Kalamazoo.

●

Simplifying Those Rear-End Jobs

(*Continued from page 30*)

be prepared to handle. It not only saves the heavy expense of installing an entire new differential assembly but it also will save an expensive tie-up.

The time required for all testing and machining operations connected with the replacing of a gear is considerably less than thirty minutes. The complete job, of course, should include removing the entire assembly, cleaning, adjusting, reconditioning the carrier, and replacing the unit in the car, truck or bus. The time for this will vary according to the construction of the rear axle.

The job requires no more skill on the part of the lathe operator than will be exercised in using the lathe for turning or grinding a piston, facing a clutch disc, refacing a valve, truing a commutator and kindred jobs.

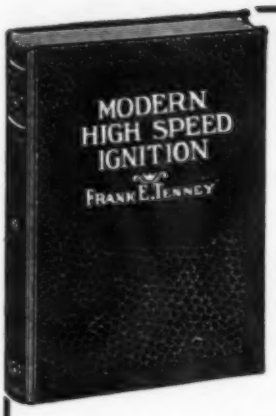
●

Have You a Motor Transport Problem?

FRED C. O'KEEFE, whose articles on fleet operation, maintenance and cost accounting have appeared in this publication, is now available to fleet owners for the solution of their motor transport problems.

Mr. O'Keefe is a municipal accountant, motor transport technician and consultant. He designed and installed the cost accounting system and established the economic operating policy followed by the Detroit Municipal Garage and described in the July, 1932, and January, 1933, issues of this publication.

He is now available to all fleet operators at a nominal fee for such duties as cost accounting design and installation, establishment of operating policies, or temporary managerial assignments. Interested operators may address Mr. O'Keefe at 2913 Springle Ave., Detroit, Mich.



It's Here!

At last we are able to offer a book that gives you the real "low-down" on High Speed Ignition. Tells you all about the new dual and twin ignition distributors—how to synchronize correctly—the new tools for synchronizing and how to use them—not too technical—no guesswork. This is a 130-page book, chock full of illustrations—134 in all. Absolutely indispensable to the service man. Will pay for itself on the very first job. Sent postpaid on receipt of $3.50.

A Book written by a Mechanic for the Mechanic—Every Service Man needs it —Use the Coupon and be Informed.

The Ferguson Publishing Co.
90 WEST STREET NEW YORK CITY

Please send me a copy of "High Speed Ignition" for which I enclose $3.50 in payment. I understand that if I am not entirely satisfied with the book I will return it and you will refund my money in full.

Name .....

Address .....

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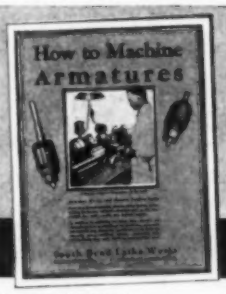
Mr. President:

DOES your Financial Statement show a Deficit? Are your Truck Deliveries causing part of this Deficit?

If so, you need a Man who can cut your Trucking Costs to a Minimum! The day is past when a Mechanic can supervise a Fleet costing thousands of dollars.

Each Fleet needs an Executive who can analyze the complicated problems of Cost Accounting, Taxation, Personnel and Sales Cooperation. He must be familiar with the latest practice in Maintenance and Operation and the modern high components of today's Transportation requirements.

Such a man is now available and would like to have the opportunity of discussing this problem with you. Strict confidence will be appreciated and respected. Address Box 815, c/o Editor, FLEET OWNER, 90 West Street, New York, N. Y.



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SOUTH BEND LATHE WORKS
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Gentlemen: **Please send, free postpaid, auto service bulletins marked at left.**

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BEFORE buying a boring bar, look to see if it has catspaws,—*find out what the catspaws do while a hole is being bored.*

To get cylinders that are accurate, straight and true, the catspaws must work during the boring operation.

The Van Norman Per-fect-o Boring Bar has 4 non-revolving supports (patented) located ½ inch back of the cutter. They travel down the freshly cut cylinder wall directly behind the cutter and provide a rigid support and guide for the cutting tool.

Taper and chatter are eliminated. Hard spots, soft spots, connecting rod throw cut-outs, open ports and electric welds that frequently cause bad jobs do not affect the accuracy or finish produced by a Van Norman Per-fect-o Boring Bar. No honing is necessary and pistons, rings and pins can be fitted immediately after boring.

Don't be misled by catspaws that are used for centering purposes only. Remember that in the Van Norman Per-fect-o they support the cutter from the beginning of the cut to the end and guarantee a round, straight hole at right angles to the top of the block.

Send for Bulletin 8132 describing 10 other important advantages.

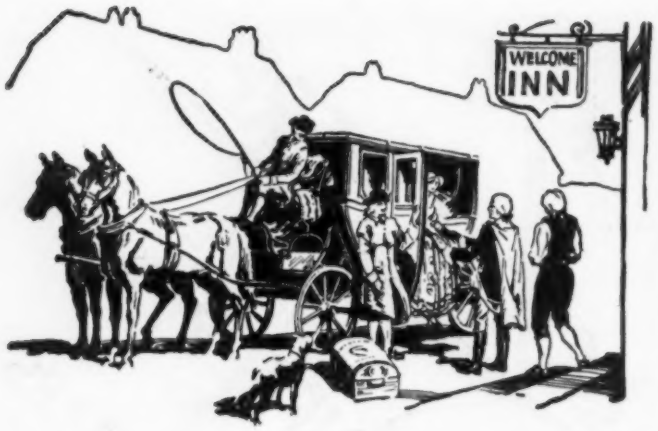
* * *

P. S. 16 motors now use cam ground pistons. Ask your jobber to tell you how he cam grinds pistons on his Van Norman Piston Grinder.

VAN NORMAN
MACHINE TOOL COMPANY

164 WILBRAHAM ST. : : SPRINGFIELD, MASS.

IT PAYS TO VAN NORMANIZE



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Rooms with Bath from $2.50

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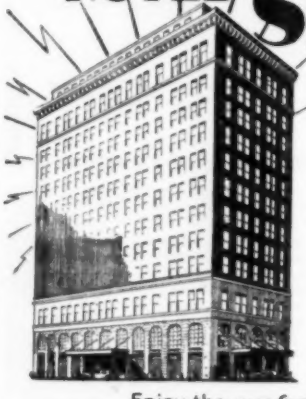

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This Operator Stopped Coil Cushion Repair!

He operates 68 trucks. Keeps a close check on all maintenance items. Repairs his truck cushions twice a year. Checked his records back three years and found he was spending *$12.00 per year per truck for cushion repair!*

Now he uses Sponge-Aire cushions because they *never need repair—yet cost no more than coil cushions.*

Write for more particulars today.

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Never a Patched or Broken Gasket

Vellumoid is a tough, compressible sheet packing that stands the gaff of the hardest service, and makes tight connections which you can absolutely rely on.

A few yards of sheet Vellumoid with a knife or ball-peen hammer, and you have immediately available Oil, Gasoline, and Water gaskets of every size and shape—each of the highest quality.

Forget the shellac pot—you don't need it with Vellumoid.

And for the cars, trucks, or busses in your fleet, keep on hand a supply of Vellumoid ready-cut gaskets. They do not stretch nor shrink—they are always ready for use.

Ask your Jobber

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THE REAL REPLACEMENT GASKET MATERIAL

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Long Life Tire Valve for Economy

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A complete line of superior heavy duty axle shafts. A special engineering service to study your own particular problems is available to responsible bus and truck operators. Write for complete details.

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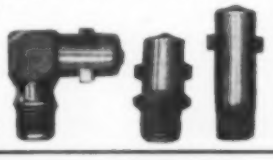
Superior fittings made of **steel** that can be safely **tightened** in place. Double length springs—longer life. Take all standard grease guns.

Cut Your Fitting Cost in Half

These better fittings come in all standard sizes and shapes, carry lower list prices and much larger discounts. They can cut your fitting costs in half and will give better service.

Write for FREE Sample
for test, Catalog Sheets and discounts.



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RACINE WISCONSIN

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Any fleet operator knows there are thousands of miles of wear left in a tire after the tread is worn smooth. But he also knows the skid hazard is great. Now he can make that extra mileage SAFE by regrooving. The ROLL-ABOUT GROOVER does the job in less than five minutes, without removing tire or wheel. It is accurate and easily operated—at an extremely attractive price. It has paid for itself in a few days on many fleets now using it, including John Wanamaker, Reading Transportation, Penna. Power & Light, Westinghouse Electric and many others. Send the coupon today.

This Coupon will save You Money!

SAFE TOOL MFG. CO., 3-33
Bridgeport, Pa.

Send me complete information and price of the "ROLL-ABOUT GROOVER".

Name: .....

Address: .....

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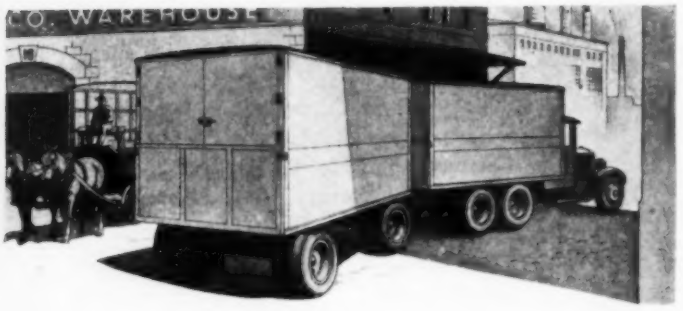
You'll see more and more of them...



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ON level paved roads you'll se two-wheel drive six-wheelers. In hilly country or over unpaved roads you'll see four-wheel drive six-wheelers, alone and pulling trailers.

It's the new, logical, economical type of equipment suited to modern hauling conditions; satisfying the limits set on weights per axle and vehicle dimensions. Sizes vary according to loads and conditions.

Timken pioneered in developing four-wheel units; and Timken offers a complete range of sizes and types—anything you require; all perfectly engineered, correct equipment. Driving axles may be bevel, worm, or double-reduction. Auxiliary axles are of the famous Timken Tubular design.

Consult Timken—It's the only safe way to modernize present equipment.

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Pep Mfg. Co.	4
Pittsburgh Parts Corp.	41
Raybestos Div. of Raybestos-Manhattan, Inc.	—
Ross Gear & Tool Co.	35
S.K.F. Industries, Inc.	—
S. P. A. Truck Corp.	8
Safe Tool Mfg. Co.	49
A. Schader's Son, Inc.	—
Sealed Power Corp	4th Cover
Service Recorder Co.	45
Severin Hotel	48
Skinner Motors, Inc.	31
South Bend Lathe Works	47
Sponge-Aire Seat Co.	49
Sunnen Products Co.	—
Thermoid Rubber Co.	3rd Cover
Timken-Detroit Axle Co.	50
Toledo Steel Products Co.	37
Trenton Auto Radiator Works	46
U. S. Axle Co.	49
United-American Bosch Corp.	19
United States Plywood Co.	46
Van Norman Machine Tool Co.	47
Vellumoid Co.	49
Welch Pac-less Pump Co.	—
White Company	—
Wisco Products, Inc.	49
Woodward Hotel	48

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